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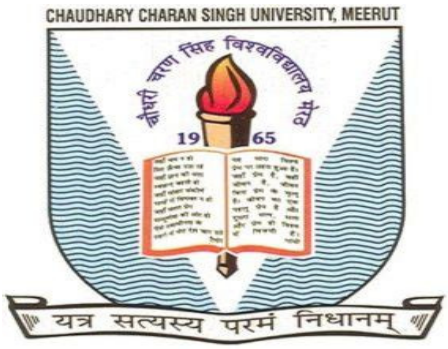

EVALUATION SCHEME &SYLLABUS
First Year
FOR

MASTER OF COMPUTER APPLICATION (MCA)

(Two Years Course)

As per
AICTE MODEL CURRICULUM
(Effective from the Session: 2020-21)

MCA (MASTER OF COMPUTER APPLICATION)

MCA FIRST YEAR, 2020-21

SEMESTER-I

S.No.	Subject Code	Subject Name	Hours			Sessional Marks			External Marks	Total Marks	Credit
			L	T	P	CT	TA	Total			
1.	**MCA- 111**	Fundamental of Computers & Emerging Technologies	4	0	0	18	12	**30**	**70**	**100**	4
2.	**MCA- 112**	Problem Solving using C	3	1	0	18	12	**30**	**70**	**100**	4
3.	**MCA- 113**	Principles of Management & Communication	4	0	0	18	12	**30**	**70**	**100**	4
4.	**MCA- 114**	Discrete Mathematics	4	0	0	18	12	**30**	**70**	**100**	4
5.	**MCA- 115**	Computer Organization & Architecture	3	1	0	18	12	**30**	**70**	**100**	4
6.	**MCA- 151**	Problem Solving using C **Lab**	0	0	4	30	20	**50**	**50**	**100**	2
7.	**MCA- 152**	Office Automation **Lab**	0	0	4	30	20	**50**	**50**	**100**	2
8.	**MCA- 153**	Professional Communication **Lab**	0	0	4	30	20	**50**	**50**	**100**	2
		Total						**300**	**500**	**800**	**26**

CT: Class Test **TA**:TeacherAssessment**L/T/P:** Lecture/ Tutorial/Practical

SEMESTER-II

S. No.	Subject Code	Subject Name	Hours			Sessional Marks			External Marks	Total Marks	Credit
			L	T	P	CT	TA	Total			
1.	**MCA-211**	Theory of Automata & Formal Languages	4	0	0	18	12	**30**	**70**	**100**	4
2.	**MCA- 212**	Object Oriented Programming	3	1	0	18	12	**30**	**70**	**100**	4
3.	**MCA- 213**	Operating Systems	4	0	0	18	12	**30**	**70**	**100**	4
4.	**MCA- 214**	Database Management Systems	4	0	0	18	12	**30**	**70**	**100**	4
5.	**MCA- 215**	Data Structures & Analysis of Algorithms	3	1	0	18	12	**30**	**70**	**100**	4
6.	**MCA – 216**	Cyber Security* **(Qualifying Course)**	2	0	0	18	12	***30**	***70**	***100**	0
7.	**MCA- 251**	Object Oriented Programming **Lab**	0	0	4	30	20	**50**	**50**	**100**	2
8.	**MCA- 252**	DBMS **Lab**	0	0	4	30	20	**50**	**50**	**100**	2
9.	**MCA- 253**	Data Structures & Analysis of Algorithms **Lab**	0	0	4	30	20	**50**	**50**	**100**	2
		Total						**300**	**500**	**800**	**26**

CT: Class Test **TA**:TeacherAssessment **L/T/P**: Lecture/ Tutorial/Practical

*** Qualifying Non-credit Course**

STUDENT PERFORMANCE AND LEARNING OUTCOMES
Session :- 2020-2021

Department of Computer Application

Program Outcome for all program offered by the Institution:-

Program Outcome (PO) - MCA

- Apply knowledge of Computing fundamentals, Computing specialization, Mathematics, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements for employability.
- Identify, formulate, research literature, and solve complex Computing problems reaching substantiated conclusions using fundamental principles of Mathematics, Computing sciences, and relevant domain disciplines for advance higher studies. .
- Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
- Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
- Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.
- Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice for enhancing skills.
- Recognize the need, and have the ability, to engage in independent learning for continual development as a Computing professional .
- Demonstrate knowledge and understanding of computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.
- Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.

- Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.
- Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

Specific Programme Outcomes (SPO) - MCA

- To prepare graduates who will create systems through software development to solve problems in Industry domain areas.
- To Prepare Graduates who will contribute to societal growth through research in their chosen field.
- To prepare graduates who will perform both as an individual and in a team through good analytical, design and implementation skills.
- To prepare graduates who will be lifelong learners through continuous professional development.

MCA 1st Year
Semester – Ist

MCA (MASTER OF COMPUTER APPLICATION) FIRST YEAR
SYLLABUS
SEMESTER-I

MCA : Year-I **Sem: I**

Subject 1: Fundamental of Computers & Emerging Technologies(MCA- 111)

Subject Outcome:

1. Discuss the impact of disruptive technologies on project design, implementation, and transformation.
2. Identify major areas where technologies can be applied and their implications for organizational change.
3. Recognize current and emerging disruptive technologies and their potential to impact social conditions, the economy, and daily life.
4. Design a project plan that incorporates a new and emerging technology and illustrates its impact on organizations and industries.
5. Review current literature on the selection, implementation, and evaluation of new and emerging technologies and their impacts.
6. Conduct and present a project on a technologies analysis that incorporates audio, video, and images.
7. Compare and contrast current and emerging technologies and their implications for social ethics and the global workplace.
8. Appreciate the unique characteristics of and differences between disruptive technologies and their impacts.
9. Recognize the importance of ethical practices with new technologies.

Syllabus

MCA – 111 : FUNDAMENTAL OF COMPUTERS & EMERGING TECHNOLOGIES L-T-P : 4-0-0 External Max. Marks : 70		
Unit	**Topic**	**Proposed Lecture**
I	**Introduction to Computer:** Definition, Computer Hardware & Computer Software **Components:** Hardware – Introduction, Input devices, Output devices, Central Processing Unit, Memory- Primary and Secondary. Software - Introduction, Types – System and Application. **Computer Languages:** Introduction, Concept of Compiler, Interpreter & Assembler **Problem solving concept:** Algorithms – Introduction, Definition, Characteristics, Limitations, Conditions in pseudo-code, Loops in pseudo code.	**08**
II	**Operating system:** Definition, Functions, Types, Classification, Elements of command based and GUI based operating system. **Computer Network:** Overview, Types (LAN, WAN and MAN), Data communication, topologies.	**08**
III	**Internet :** Overview, Architecture, Functioning, Basic services like WWW, FTP, Telnet, Gopher etc., Search engines, E-mail, Web Browsers. **Internet of Things (IoT):** Definition, Sensors, their types and features, Smart Cities, Industrial Internet of Things.	**08**

IV	**Block chain:** Introduction, overview, features, limitations and application areas fundamentals of Block Chain. **Crypto currencies:** Introduction , Applications and use cases **Cloud Computing:** It nature and benefits, AWS, Google, Microsoft & IBM Services	**08**
V	**Emerging Technologies:** Introduction, overview, features, limitations and application areas of Augmented Reality , Virtual Reality, Grid computing, Green computing, Big data analytics, Quantum Computing and Brain Computer Interface	**08**

Suggested Readings:

1. Rajaraman V., –Fundamentals of Computers‖, Prentice-Hall of India, 6th Edition Dec 2014.
2. Norton P., –Introduction to Computers‖, McGraw Hill Education, 7th Edition July 2017
3. Goel A., –Computer Fundamentals‖, Pearson, Nov 2017
4. Balagurusamy E., ― Fundamentals of Computers‖, McGraw Hill, second reprint 2010
5. Thareja R., –Fundamentals of Computers‖, Oxford University Press 2016

Subject : 2 Problem Solving using C (MCA- 112)

Subject Outcome:

1. To learn the basics of different types of programming
2. To understand the syntax and building blocks of the C- program.
3. To learn to solve a problem using the CProgram.
4. To compile and debug a C- Program.
5. To generate an executable file from program.

Syllabus

MCA - 112 : PROBLEM SOLVING USING C

L-T-P : 3-1-0 External Max. Marks : 70

Unit	Topic	Proposed Lecture
I	**Basics of programming:** Approaches to problem solving, Use of high level programming language for systematic development of programs, Concept of algorithm and flowchart, Concept and role of structured programming. **Basics of C**: History of C, Salient features of C, Structure of C Program, Compiling C Program, Link and Run C Program, Character set, Tokens, Keywords, Identifiers, Constants, Variables, Instructions, Data types, Standard Input/Output, Operators and expressions.	**08**
II	**Conditional Program Execution:** if, if-else, and nested if-else statements, Switch statements, Restrictions on switch values, Use of break and default with switch, Comparison of switch and if-else. **Loops and Iteration:** for, while and do-while loops, Multiple loop variables, Nested loops, Assignment operators, break and continue statement. **Functions:** Introduction, Types, Declaration of a Function, Function calls, Defining functions, Function Prototypes, Passing arguments to a function Return values and their types, Writing multifunction program, Calling function by value, Recursive functions.	**08**

III	**Arrays:** Array notation and representation, Declaring one-dimensional array, Initializing arrays, Accessing array elements, Manipulating array elements, Arrays of unknown or varying size, Two-dimensional arrays, Multidimensional arrays. **Pointers:** Introduction, Characteristics, * and & operators, Pointer type declaration and assignment, Pointer arithmetic, Call by reference, Passing pointers to functions, arrayof pointers, Pointers to functions, Pointer to pointer, Array of pointers. **Strings:** Introduction, Initializing strings, Accessing string elements, Array of strings, Passing strings to functions, String functions.	**08**

IV	**Structure:** Introduction, Initializing, defining and declaring structure, Accessing members, Operations on individual members, Operations on structures, Structure within structure, Array of structure, Pointers to structure. **Union:** Introduction, Declaring union, Usage of unions, Operations on union. Enumerated data types **Storage classes**: Introduction, Types- automatic, register, static and external.	**08**
V	**Dynamic Memory Allocation**: Introduction, Library functions – malloc, calloc, realloc and free. **File Handling:** Basics, File types, File operations, File pointer, File opening modes, File handling functions, File handling through command line argument, Record I/O in files. **Graphics:** Introduction, Constant, Data types and global variables used in graphics, Library functions used in drawing, Drawing and filling images, GUI interaction within the program.	**08**

Suggested Readings:

1. Kanetkar Y., ―Let Us C‖, BPB Publications. Revised and Updated 2017 edition.
2. Hanly J. R. and Koffman E. B.,–Problem Solving and Program Design in C‖, Pearson Education. 5th Edition, 2008
3. Schildt H., ―C- The Complete Reference‖, McGraw-Hill. 4th Edition (December 10, 2002)
4. Goyal K. K. and Pandey H.M., Trouble Free C‖, University Science Press, 2017
5. Gottfried B., –Schaum's Outlines- Programming in C‖, McGraw-Hill Publications.
6. Kochan S.G., –Programming in C‖, Addison-Wesley. 4th Edition**,** 2015
7. Dey P. and Ghosh M., ―Computer Fundamentals and Programming in C‖, Oxford University Press. Second Edition, July 2013

Subject 3: Principles of Management & Communication(MCA- 113)

Subject Outcome:

1. Exhibit adequate verbal and non-verbal communication skills .
2. Demonstrate effective discussion, presentation and writing skills.
3. Increase confidence in their ability to read, comprehend, organize, and retain written information. Improve reading fluency.
4. Write coherent speech outlines that demonstrate their ability to use organizational formats with a specific purpose; Deliver effective
5. speeches that are consistent with and appropriate for the audience and purpose.
6. Develop proper listening skills; articulate and enunciate words and sentences clearly and efficiently.

7. Show confidence and clarity in public speaking projects; be schooled in preparation and research skills for oral presentations.

Syllabus

MCA - 113 : PRINCIPLES OF MANAGEMENT & COMMUNICATION L-T-P : 4-0-0 External Max. Marks : 70		
Unit	**Topic**	**Proposed Lecture**
I	**Management**: Need, Scope, Meaning and Definition. The process of Management, Development of Management thought F.W. Taylor and Henry Fayol, Horothorne Studies, Qualities of an Efficient Management.	**08**
II	**Planning & Organising:** Need, Scope and Importance of Planning, Steps in planning, Decision making model. Organising need and Importance, Organisational Design, Organisational structure, centralisation and Decentralisation, Deligation.	**08**
III	**Directing & Controlling:** Motivation—Meaning, Importance, need.Theories of Motivation, Leadership—meaning, need and importance, leadership style, Qualities of effective leader, principles of directing, Basic control process, Different control Techniques.	**08**
IV	**Introduction to Communication:** What is Communication, Levels of communication, Barriers to communication, Process of Communication, Non-verbal Communication, The flow of Communication: Downward, Upward, Lateral or Horizontal (Peer group) Communication, Technology Enabled communication, Impact of Technology, Selection of appropriate communication Technology, Importance of Technical communication.	**08**
V	**Business letters :** Sales & Credit letters; Claim and Adjustment Letters; Job application and Resumes. **Reports:** Types; Structure, Style & Writing of Reports. **Technical Proposal:** Parts; Types; Writing of Proposal; Significance. Nuances of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features ofvoice; Communication skills, Presentation strategies, Group Discussion; Interview skills; Workshop; Conference; Seminars.	**08**

Suggested Readings:

1. P.C. Tripathi, P.N. Reddy, "Principles of Management", McGraw Hill Education 6th Edition 2017.
2. C. B. Gupta, "Management Principles and Practice", Sultan Chand & Sons 3rd edition 2012.
3. T.N.Chhabra, "Business Communication", Sun India Publication.
4. V.N.Arora and Laxmi Chandra, "Improve Your Writing", Oxford Univ. Press, 2001, New Delhi.
5. Madhu Rani and SeemaVerma, "Technical Communication: A Practical Approach", Acme Learning, New Delhi-2011.
6. Meenakshi Raman &Sangeeta Sharma, "Technical Communication- Principles and Practices", Oxford Univ. Press, 2007, New Delhi.
7. Koontz Harold &Weihrich Heinz, "Essentials of Management", McGraw Hill 5thEdition 2008.
8. Robbins and Coulter, "Management", Prentice Hall of India, 8th Edition (January 14, 2004).
9. James A. F., Stoner, "Management", Pearson Education Delhi. Seventh Edition,

2009.
10. P.D.Chaturvedi, "Business Communication", Pearson Education.2011

Subject : 4 Discrete Mathematics (MCA- 114)

Subject Outcome:

1. Be familiar with constructing proofs.
2. Be familiar with elementary formal logic.
3. Be familiar with set algebra.
4. Be familiar with combinatorial analysis.
5. Be familiar with recurrence relations.
6. Be familiar with graphs and trees, relations and functions, and finite automata.
7. Be exposed to the strategies for compare relative efficiency of algorithms

Syllabus

MCA - 114 : DISCRETE MATHEMATICS

L-T-P : 4-0-0 External Max. Marks : 70

Unit	Topic	Proposed Lecture
I	**Set Theory:** Introduction, Size of sets and Cardinals, Venn diagrams, Combination of sets, Multisets, Ordered pairs and Set Identities. **Relation:** Definition, Operations on relations, Composite relations, Properties of relations, Equality of relations, Partial order relation. **Functions:** Definition, Classification of functions, Operations on functions, Recursively defined functions.	08
II	**Posets, Hasse Diagram and Lattices:** Introduction, Partial ordered sets, Combination of Partial ordered sets, Hasse diagram, Introduction of lattices, Properties of lattices –Bounded, Complemented, Modular and Complete lattice. **Boolean Algebra:** Introduction, Axioms and Theorems of Boolean algebra, Boolean functions. Simplification of Boolean functions, Karnaugh maps, Logic gates.	08
III	**Propositional:** Propositions, Truth tables, Tautology, Contradiction, Algebra of Propositions, Theory of Inference and Natural Detection. **Predicate Logic:** Theory of Predicates, First order predicate, Predicate formulas, Quantifiers, Inference theory of predicate logic.	08
IV	**Algebraic Structures:**Introduction to algebraic Structures and properties. Types of algebraic structures: Semi group, Monoid, Group, Abelian group and Properties of group. Subgroup, Cyclic group, Cosets, Permutation groups, Homomorphism and Isomorphism of groups. **Rings and Fields:** Definition and elementary properties of Rings and Fields.	08

V	**Natural Numbers:** Introduction, Piano's axioms, Mathematical Induction, Strong Induction and Induction with Nonzero Base cases. **Recurrence Relation & Generating functions:** Introduction and properties of Generating Functions. Simple Recurrence relation with constant coefficients and Linear recurrence relation without constant coefficients. Methods of solving recurrences. **Combinatorics:** Introduction, Counting techniques and Pigeonhole principle, Polya's Counting theorem.	**08**

Suggested Readings:

1. Kenneth H. Rosen, "Discrete Mathematics and Its Applications", McGraw Hill, 2006.
2. B. Kolman, R.C Busby and S.C Ross, "Discrete Mathematics Structures", Prentice Hall ,2004.
3. R.P Girimaldi, "Discrete and Combinatorial Mathematics", Addison Wesley, 2004.
4. Y.N. Singh, "Discrete Mathematical Structures", Wiley- India, First edition, 2010.
5. Swapankumar Sarkar, "A Textbook of Discrete Mathematics‖, S. Chand & Company PVT. LTD.V.
6. Krishnamurthy, "Combinatorics Theory & Application", East-West Press Pvt. Ltd., New Delhi.
7. Liptschutz, Seymour, "Discrete Mathematics", McGraw Hill.
8. J.P. Trembely&R.Manohar, "Discrete Mathematical Structure with application to Computer Science", McGraw Hill.

Subject 5 : Computer Organization & Architecture (MCA- 115)

Subject Outcome:

Computer Organization and Architecture

1. Understand the theory and architecture of central processing unit.
2. Analyze some of the design issues in terms of speed, technology, cost, performance.
3. Design a simple CPU with applying the theory concepts.
4. Use appropriate tools to design verify and test the CPU architecture.
5. Learn the concepts of parallel processing, pipelining and interprocessor communication.
6. Understand the architecture and functionality of central processing unit.
7. Exemplify in a better way the I/O and memory organization.
8. Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.

Syllabus

MCA - 115 : COMPUTER ORGANIZATION & ARCHITECTURE

L-T-P : 3-1-0 External Max. Marks : 70

Unit	Topic	Proposed Lecture
I	**Introduction:** Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. **Processor organization:** general registers organization, stack organization and addressing modes.	**08**
II	**Arithmetic and logic unit:** Look ahead carries adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design. IEEE Standard for Floating Point Numbers.	**08**

III	**Control Unit:** Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc), micro operations, execution of a complete instruction. Program Control, Reduced Instruction Set Computer, Pipelining. Hardwire and micro programmed control: micro-program sequencing, concept of horizontal and vertical microprogramming.	**08**
IV	**Memory:** Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories. Cache memories: concept and design issues & performance, address mapping and replacement Auxiliary memories: magnetic disk, magnetic tape and optical disks Virtual memory: concept implementation.	**08**
V	**Input / Output:** Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.	**08**

Suggested Readings:

9. Kenneth H. Rosen, "Discrete Mathematics and Its Applications", McGraw Hill, 2006.
10. B. Kolman, R.C Busby and S.C Ross, "Discrete Mathematics Structures", Prentice Hall ,2004.
11. R.P Girimaldi, "Discrete and Combinatorial Mathematics", Addison Wesley, 2004.
12. Y.N. Singh, "Discrete Mathematical Structures", Wiley- India, First edition, 2010.
13. Swapankumar Sarkar, "A Textbook of Discrete Mathematics‖, S. Chand & Company PVT. LTD.5 edition 2009.
14. Krishnamurthy, "Combinatorics Theory & Application", East-West Press Pvt. Ltd., New Delhi.
15. Liptschutz, Seymour, "Discrete Mathematics", McGraw Hill. Third edition, 2009
16. J.P. Trembely&R.Manohar, "Discrete Mathematical Structure with application to Computer Science", McGraw Hill. 30th Reprint (2007)

Problem Solving using C Lab(MCA- 151)

Syllabus

MCA - 151: PROBLEM SOLVING USING C LAB

L-T-P : 0-0-4 External Max. Marks : 50

Course Outcome:

CO1 :
Write, compile, debug and execute programs in a C programming environment.

CO2
Write programs that incorporate use of variables, operators and expressions along with data types.

CO3
Write programs for solving problems involving use of decision control structures and loops.

CO4
Write programs that involve the use of arrays, structures and user defined functions.

CO5
Write programs using graphics and file handling operations.

1. Program to perform graphical operations in C language.
2. Program to implement conditional statements in C language.
3. Program to implement switch-case statement in C language
4. Program to implement looping constructs inC language.
5. Program to perform basic input-output operations in C language.
6. Program to implement user defined functions in C language.
7. Program to implement recursive functions in C language.
8. Program to implement one-dimensional arrays in C language.
9. Program to implement two-dimensional arrays in C language.
10. Program to perform various operations on two-dimensional arrays in C language.
11. Program to implement multi-dimensional arrays in C language.
12. Program to implement string manipulation functions in C language.
13. Program to implement structure in C language.
14. Program to implement union in C language.
15. Program to perform file handling operations in C language.

Note: The Instructor may add/delete/modify experiments, wherever he/she feels in a justified manner.

Subjects : 2 Office Automation Lab(MCA- 152)

Course Outcome:

1. To provide a formal connection between algorithmic problem solving and the theory of languages and automata and develop them into a mathematical (abstract) view towards algorithmic design and in general computation itself.
2. The course should in addition clarify the practical view towards the applications of these ideas in the engineering part as well.
3. Become proficient in key topics of theory of computation, and to have the opportunity to explore the current topics in this area

Syllabus

MCA - 152 Office Automation LAB	
L-T-P : 0-0-4	External Max. Marks : 50

1. Basic operating system windows working environment. Working on various office advance component available in MS-Office/ Open-Office for Documents, Excel and Power point ***(Minimum Ten Labs)***.
2. Introduction to HTML Language and its basic tags to make static pages as form, table, and simple text data formatted ***(Minimum Two Labs)***.
3. Install and configure Python on system and know how to execute basic programs for condition and loop structures ***(Minimum Two Labs)***.
4. Write a Report with standard format and styles using MS-Office/ Open-Office ***(Minimum Two Labs)***.
5. Write a Research paper with standard format and styles using MS-Office/ Open-Office.
   (Minimum Two Labs).
6. Prepare Make a Mark-Sheet/ Balance-Sheet in excel with all formatting and styles ***(Minimum One Lab)***.
7. Prepare a presentation in Power Point on any one topic from current semester subjects
   (Minimum One Lab).

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

Subject 3: Professional Communication Lab(MCA- 153)

Course Outcome:

CO1 Develop the ability to work as a team member as an integral activity in the workplace.
CO2 Increase confidence in their ability to read, comprehend, organize, and retain written information. Improve reading fluency.
CO3 Write coherent speech outlines that demonstrate their ability to use organizational formats with a specific purpose; Deliver effective speeches that are consistent with and appropriate for the audience and purpose.
CO4 Develop proper listening skills; articulate and enunciate words and sentences clearly and efficiently.

Syllabus

MCA - 153 : PROFESSIONAL COMMUNICATION LAB	
L-T-P : 0-0-4	External Max. Marks : 50

1. Group Discussion: participating in group discussions- understanding group dynamics.
2. GD strategies-activities to improve GD skills. Practical based on Accurate and Current Grammatical Patterns.
3. Interview Etiquette-dress code, body language attending job interview – Telephone/Skype interview one to one interview &Panel interview.
4. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistic/ Kinesics, practicing word stress, rhythm in sentences, weak forms, intonation.
5. Oral Presentation Skills for Technical Paper/Project Reports/ Professional Reports based on proper Stress and Intonation Mechanics voice modulation ,Audience Awareness, Presentation plan visual aids.
6. Speaking:-Fluency & Accuracy in speech- positive thinking, Improving Self expression Developing persuasive speaking skills, pronunciation practice (for accept neutralization) particularly of problem sounds, in isolated words as well as sentences.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehension Skills based on Reading and Listening Practical's on a model Audio-Visual Usage.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

MCA : Year-I **Sem: II**

Subject 1: THEORY OF AUTOMATA & FORMAL LANGUAGES(MCA – 211)

Subject Outcome:

1. To provide a formal connection between algorithmic problem solving and the theory of languages and automata and develop them into a mathematical (abstract) view towards algorithmic design and in general computation itself.
2. The course should in addition clarify the practical view towards the applications of these ideas in the engineering part as well.
3. Become proficient in key topics of theory of computation, and to have the opportunity to explore the current topics in this area

Syllabus

MCA - 211: THEORY OF AUTOMATA & FORMAL LANGUAGES

L-T-P : 4-0-0 External Max. Marks : 70

Unit	Topic	Proposed Lecture

I	**Basic Concepts and Automata Theory:** Introduction to Theory of Computation- Automata, Computability and Complexity, Alphabet, Symbol, String, Formal Languages, Deterministic Finite Automaton (DFA)- Definition, Representation, Acceptability of a String and Language, Non Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with ε-Transition, Equivalence of NFA's with and without ε-Transition, Finite Automata with output- Moore machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata, Myhill-NerodeTheorem, Simulation of DFA and NFA.	**08**
II	**Regular Expressions and Languages:**RegularExpressions,TransitionGraph,Kleen'sTheorem, Finite Automata and Regular Expression- Arden's theorem, Algebraic Method Using Arden's Theorem, Regular and Non-Regular Languages- Closure properties of Regular Languages, Pigeonhole Principle, Pumping Lemma, Application of Pumping Lemma, Decidability- Decision properties, Finite Automata and Regular Languages, Regular Languages and Computers, Simulation of Transition Graph and Regular language.	**08**
III	**Regular and Non-Regular Grammars**: Context Free Grammar(CFG)-Definition, Derivations, Languages, Derivation Trees and Ambiguity, Regular Grammars-Right Linear and Left Linear grammars, Conversion of FA into CFG and Regular grammar into FA, Simplification of CFG, Normal Forms-Chomsky Normal Form(CNF), Greibach Normal Form(GNF),Chomsky Hierarchy, Programming problems based on the properties of CFGs.	**08**
IV	**Push Down Automata and Properties of Context Free Languages**: Nondeterministic Pushdown Automata (NPDA)-Definition, Moves, A Language Accepted by NPDA, Deterministic Pushdown Automata(DPDA) and Deterministic Context free Languages(DCFL),	**08**
	Pushdown Automata for Context Free Languages, Context Free grammars for Pushdown Automata, Two stack Pushdown Automata, Pumping Lemma for CFL, Closure properties of CFL, Decision Problems of CFL, Programming problems based on the properties of CFLs.	
V	**Turing Machines and Recursive Function Theory** : Basic Turing Machine Model, Representation of Turing Machines, Language Acceptability of Turing Machines, Techniques for Turing Machine Construction, Modifications of Turing Machine, Turing Machine as Computer of Integer Functions, Universal Turing machine, Linear Bounded Automata, Church's Thesis, Recursive and Recursively Enumerable language, Halting Problem,Post Correspondence Problem, Introduction to Recursive FunctionTheory.	**08**

Suggested Readings:

1. J.E. Hopcraft, R. Motwani, and Ullman, "Introduction to Automata theory, Languages and Computation", Pearson EducationAsia,3rd Edition, 2006.
2. J. Martin, "Introduction to languages and the theory of computation", McGraw Hill, 4thEdition 2010.
3. C. Papadimitrou and C. L. Lewis, "Elements and Theory of Computation",PHI.
4. K.L.P. Mishra and N. Chandrasekaran ,"TheoryofComputer Science Automata Languages and Computation" , PHI. 3rd Edition, 2006

Subject 2 : OBJECT ORIENTED PROGRAMMING (MCA - 212)

Subject Outcome:

1. Gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc.
2. Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and exception handling mechanisms.
3. Understand object, garbage collection, classes and interfaces.
4. Understand the principles of inheritance, packages and interfaces.
5. Demonstrate the concepts of polymorphism and inheritance Demonstrate

Syllabus

MCA - 212 : OBJECT ORIENTED PROGRAMMING

L-T-P : 3-1-0 External Max. Marks : 70

Unit	Topic	Proposed Lecture
I	**Introduction:** Object Oriented Programming: objects, classes, Abstraction, Encapsulation, Inheritance, Polymorphism, OOP in Java, Characteristics of Java, The Java Environment, Java Source File Structure, and Compilation. Fundamental Programming Structures in Java: Defining classes in Java, constructors, methods, access specifies, static members, Comments, Data Types, Variables, Operators, Control Flow, Arrays.	08
II	**Inheritance, Interfaces, and Packages:** Inheritance: Super classes, sub classes, Protected members, constructors in sub classes, Object class, abstract classes and methods.Interfaces:defininganinterface,implementinginterface,differencesbetween classes and interfaces and extending interfaces, Object cloning, inner classes. Packages: Defining Package, CLASSPATH Setting for Packages, Making JAR Files for Library Packages, Import and Static Import Naming Convention ForPackages, Networking java.net package.	08
III	**Exception Handling, I/O**: Exceptions: exception hierarchy, throwing and catching exceptions,built-inexceptions,creatingownexceptions,StackTraceElements.Input/ Output Basics: Byte streams and Character streams, Reading and Writing, Console Reading and WritingFiles.	08

IV	**Multithreading and Generic Programming:** Differences between multi-threading andmultitasking,threadlifecycle,creatingthreads,synchronizingthreads ,Inter-thread communication, daemon threads, thread groups. Generic Programming: Generic classes, generic methods, Bounded Types: Restrictions and Limitations.	**08**
V	**EventDrivenProgramming:**Graphicsprogramming:Frame,Components,working with 2D shapes,Using colors, fonts, and images. Basics of event handling: event handlers,adapterclasses,actions,mouseevents,AWTeventhierarchy.Introductionto Swing: layout management, Swing Components: Text Fields, Text Areas, Buttons, Check Boxes, Radio Buttons, Lists, choices, Scrollbars, Windows Menus andDialog Boxes.	**08**

Suggested Readings:

1. HerbertSchildt,"JavaThecompletereference|",McGrawHillEducation,8thEdition,2011.
2. Cay S. Horstmann, Gary Cornell, "Core Java Volume –I Fundamentals", Prentice Hall, 9th Edition, 2013.
3. Steven Holzner, "Java Black Book",Dreamtech.2005
4. BalagurusamyE,"ProgramminginJava",McGrawHill*4th Edition* 2009
5. Naughton,Schildt,"TheCompletereferencejava2",McGrawHill Seventh *Edition*, 2007

STUDENT PERFORMANCE AND LEARNING OUTCOMES

Session :- 2020-2021

Department of Computer Application

Program Outcome for all program offered by the Institution:-

Program Outcome (PO) - MCA

- Apply knowledge of Computing fundamentals, Computing specialization, Mathematics, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.
- Identify, formulate, research literature, and solve complex Computing problems reaching substantiated conclusions using fundamental principles of Mathematics, Computing sciences, and relevant domain disciplines.
- Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
- Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
- Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.
- Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.

- Recognize the need, and have the ability, to engage in independent learning for continual development as a Computing professional.
- Demonstrate knowledge and understanding of computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.
- Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.
- Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.
- Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

Specific Programme Outcomes (SPO) - MCA

- To prepare graduates who will create systems through software development to solve problems in Industry domain areas.
- To Prepare Graduates who will contribute to societal growth through research in their chosen field.
- To prepare graduates who will perform both as an individual and in a team through good analytical, design and implementation skills.
- To prepare graduates who will be lifelong learners through continuous professional development.

Subject 3 : OPERATING SYSTEMS(MCA-213)

Subject Outcome:

1. Explain main components, services, types and structure of Operating Systems.
2. Apply the various algorithms and techniques to handle the various concurrency control issues.
3. Compare and apply various CPU scheduling algorithms for process execution.
4. Identify occurrence of deadlock and describe ways to handle it.
5. Explain and apply various memory, I/O and disk management techniques.

Syllabus

MCA - 213 : OPERATING SYSTEMS

L-T-P : 4-0-0 External Max. Marks : 70

Unit	Topic	Proposed Lecture
I	**Introduction**: Operating System Structure- Layered structure, System Components, Operating system functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multi processSystems, Multithreaded Systems, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.	08

II	**Concurrent Processes**: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation, Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem, Inter Process Communication models andSchemes, Process generation.	**08**
III	**CPU Scheduling:** Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance anddetection, Recovery from deadlock.	**08**
IV	**Memory Management:** Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms,Thrashing, Cache memory organization, Locality of reference.	**08**
V	**I/O Management and Disk Scheduling**: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization andaccess mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.	**08**

Suggested Readings:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts",WileyPublication. Seventh *Edition 2004*
2. SibsankarHalder and Alex A Arvind, "Operating Systems", PearsonEducation. 2nd *Edition2014*
3. Harvey M Dietel, "An Introduction to Operating System", PearsonEducation.
4. William Stallings, "Operating Systems: Internals and Design Principles", 6th Edition, PearsonEducation 2010.
5. Harris, Schaum's Outline Of Operating Systems, McGrawHill First *Edition 2001*

Subject 4 : DATABASE MANAGEMENT SYSTEMS(MCA – 214)

Subject Outcome:

1. Defines the basics of the relational data model.
2. Lists the database design process steps.
3. Will be able to design and implement properly structured databases that match the standards based under realistic constraints and conditions.
4. Develops an Entity-Relationship model based on user requirements.

Syllabus

MCA - 214 : DATABASE MANAGEMENT SYSTEMS		
L-T-P : 4-0-0		External Max. Marks : 70
Unit	**Topic**	**Proposed Lecture**

I	**Introduction:**Overview,DatabaseSystemvsFileSystem,DatabaseSystemConcept andArchitecture,DataModelSchemaandInstances,DataIndependence andDatabase Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. Data Modeling Using the Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of SuperKey, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree.	**08**
II	**Relational data Model and Language:** Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. IntroductiontoSQL:CharacteristicsofSQL,AdvantageofSQL.SQLDataTypeand Literals.TypesofSQLCommands.SQLOperatorsandtheirProcedure.Tables,Views andIndexes.QueriesandSubQueries.AggregateFunctions.Insert,Updateand Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Proceduresin SQL/PL SQL	**08**
III	**Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design	**08**
IV	**Transaction Processing Concept:** Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling. Distributed Database: Distributed Data Storage, Concurrency Control, Directory System	**08**
V	**Concurrency Control Techniques:** Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction, Case Study of Oracle.	**08**

Suggested Readings:

1. Korth, Silbertz, Sudarshan," Database Concepts", McGrawHill. Seventh Edition 2019
2. Date C J, "An Introduction to Database Systems", AddisionWesley. 3rd*Edition2018*
3. Elmasri,Navathe,"FundamentalsofDatabaseSystems",AddisionWesley. 7th*Edition2016*
4. O'Neil, "Databases", ElsevierPub. 1st*Edition2016*
5. Ramakrishnan, "Database Management Systems", McGrawHill. 3rd*Edition2002*
6. Leon &Leon,"Database Management Systems", Vikas PublishingHouse.
7. BipinC.Desai,"AnIntroductiontoDatabaseSystems",GagotiaPublications. 4th *Edition*, 2005

Subject 5 : DATA STRUCTURES & ANALYSIS OF ALGORITHMS(MCA – 215)

Subject Outcome:

1. Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in

memory and used by algorithms

2. Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs
3. Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs
4. Demonstrate different methods for traversing trees
5. Compare alternative implementations of data structures with respect to performance
6. Compare and contrast the benefits of dynamic and static data structures implementations
7. Describe the concept of recursion, give examples of its use, describe how it can be implemented using a stack
8. Design and implement an appropriate hashing function for an application
9. Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing

Syllabus

MCA - 215: DATA STRUCTURES & ANALYSIS OF ALGORITHMS

L-T-P :3-1-0 External Max. Marks : 70

Unit	Topic	Proposed Lecture
I	**Introduction to data structure:** Data, Entity, Information, Difference between Data and Information, Data type , Build in data type, Abstract data type, Definition of data structures, Types of Data Structures: Linear and Non-Linear Data Structure, Introduction to Algorithms: Definition of Algorithms, Difference between algorithm and programs, properties of algorithm, Algorithm Design Techniques, Performance Analysis of Algorithms, Complexity of various code structures, Order of Growth, Asymptotic Notations. **Arrays:** Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Derivation of Index Formulae for 1-D,2-D Array Application of arrays, Sparse Matrices and their representations. **Linked lists:** Array Implementation and Pointer Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition Subtraction & Multiplications of Single variable.	**08**
II	**Stacks**: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Iteration and Recursion- Principles of recursion, Tail recursion, Removal of recursion Problem solving using iteration and recursion with examples such as binary search, Fibonacci numbers, and Hanoi towers. **Queues:** Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and PriorityQueue. **Searching:** Concept of Searching, Sequential search, Index Sequential Search,BinarySearch.ConceptofHashing&Collisionresolution Techniques used in Hashing.	**08**
III	**Sorting:** Insertion Sort, Selection Sort, Bubble Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time: Counting Sort and Bucket Sort. **Graphs:** Terminology used with Graph, Data Structure for Graph Representations: Adjacency Matrices, Adjacency List, Adjacency. Graph Traversal: Depth First Search and Breadth First Search,	**08**

	Connected Component.	
IV	**Trees:** Basic terminology used with Tree, Binary Trees, Binary Tree Representation: Array Representation and Pointer (Linked List) Representation, Binary Search Tree, Complete Binary Tree, A Extended Binary Trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Constructing Binary Tree from given Tree Traversal, Operation of Insertion, Deletion, Searching & Modification of data in Binary Search Tree. Threaded Binary trees, Huffman coding using Binary Tree, AVL Tree and B Tree.	**08**
V	Divide and Conquer with Examples Such as Merge Sort, Quick Sort, Matrix Multiplication: Strassen's Algorithm Dynamic Programming: Dijikstra Algorithm, Bellman Ford Algorithm, All- pair Shortest Path: Warshal Algorithm, Longest Common Sub-sequence Greedy Programming: Prims and Kruskal algorithm.	**08**

Suggested Readings:

1. Cormen T. H., Leiserson C. E., RivestR. L., and Stein C.,"Introduction to Algorithms", PHI. 3rd edition
2. Horowitz Ellis, SahniSartaj and Rajasekharan S., "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.
3. DaveP.H.,H.B.Dave,"DesignandAnalysisofAlgorithms",2ndEdition,PearsonEducation 2013.
4. Lipschuts S., "Theory and Problems of Data Structures", Schaum'sSeries. 2nd *Edition*
5. GoyalK. K., Sharma Sandeep& Gupta Atul, "Data Structures and Analysis of Algorithms", HP Hamilton.
6. Lipschutz,DataStructuresWithC-SIE-SOS,McGrawHill 3rd edition
7. SamantaD.,"ClassicDataStructures",2ndEditionPrenticeHallIndia.
8. Goodrich M. T. and Tomassia R., "Algorithm Design: Foundations, Analysis and Internet examples", John Wiley andsons.
9. Sridhar S., "Design and Analysis of Algorithms", Oxford Univ.Press. 3rd edition 2014
10. Aho, Ullman and Hopcroft, "Design and Analysis of algorithms", PearsonEducation. 3rd *Edition*
11. R. Neapolitan and K. Naimipour, "Foundations of Algorithms",4th edition, Jones an Bartlett Studentedition.
12. ReemaThareja, Data Structures using C, Oxford Univ.Press 2nd edition 2014

Subject 6 : CYBER SECURITY(Qualifying Course) (MCA-216)

Subject Outcome:

1. Follow a structured model in Security Systems Development Life Cycle (SDLC)
2. Detect attack methodology and combat hackers from intrusion or other suspicious attempts at connection to gain unauthorized access to a computer and its resources
3. Protect data and respond to threats that occur over the Internet
4. Design and implement risk analysis, security policies, and damage assessment
5. Plan, implement and audit operating systems' security in a networked, multi-platform and cross platform environment
6. Provide contingency operations that include administrative planning process for incident response,

disaster recovery, and business continuity planning within information security

Syllabus

MCA - 216 : CYBER SECURITY L-T-P :2-0-0 (Qualifying Course) External Max. Marks : 70		
Unit	**Topic**	**Proposed Lecture**
I	**Introduction-** Introduction to Information Systems, Types of Information Systems, Development of Information Systems, Introduction to Information Security and CIA triad, Need for Information Security, Threats to Information Systems, Information Assurance and Security RiskAnalysis, Cyber Security.	**08**
II	**Application Security-** (Database, E-mail and Internet), Data Security Considerations-(Backups, Archival Storage and Disposal of Data), Security Technology-(Firewall , VPNs, Intrusion Detection System), Access Control. Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail Viruses, Macro Viruses, Malicious Software, Network and Denial of Services Attack.	**08**
III	Introduction to E-Commerce , Threats to E-Commerce, Electronic Payment System, e- Cash, Credit/Debit Cards. Digital Signature, Cryptography Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets - Access Control, CCTV,Backup Security Measures.	**08**
IV	**Security Policies**- Why policies should be developed, Policy Review Process, Publication and Notification Requirement of policies, Types of policies – WWW policies, Email Security policies, Corporate Policies, Sample SecurityPolicies. **Case Study –** Corporate Security	**08**
V	**Information Security Standards-**ISO, IT Act, Copyright Act, IPR. Cyber Crimes , Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law, Copy Right Law , Semiconductor Law and Patent Law , Software Piracy and Software License.	**08**

OBJECT ORIENTED PROGRAMMING LAB(MCA – 251)

Course Outcome :

CO1 Use the Concept of Data Abstraction and Encapsulation in C++ programs.

CO2 Design and Develop C++ program using the concept such as polymorphism, virtual function, exception handling and template.

CO3 Apply object oriented techniques to analyze, design and develop a complete solution for a given problem.

MCA – 251 : OBJECT ORIENTED PROGRAMMING LAB

L-T-P :0-0-4External Max. Marks : 50

1. Use Java compiler and eclipse platform to write and execute javaprogram.
2. Creating simple javaprograms,
3. Understand OOP concepts and basics of Javaprogramming.
4. Create Java programs using inheritance andpolymorphism.
5. Implement error-handling techniques using exception handling andmultithreading.
6. Understand the use of javapackages.
7. File handling and establishment of databaseconnection.
8. Develop a calculator application injava.
9. Develop a Client ServerApplication.
10. Develop GUI applications using Swingcomponents.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

DATABASE MANAGEMENT SYSTEMS LAB(MCA - 252)

Course Outcome

CO1 Use the Concept of Database .

CO2 Write SQL commands to query a database.

CO3 Write PL/SQL programs for implementing stored procedures, stored functions, cursors, trigger and packages.

Syllabus

MCA - 252: DATABASE MANAGEMENT SYSTEMS LAB

L-T-P :0-0-4 External Max. Marks : 50

1. Installing oracle/MYSQL.
2. Creating Entity-Relationship Diagram using casetools.
3. Writing SQL statements Using ORACLE/MYSQL:
   a.Writing basic SQL SELECT statements. b.Restricting and sorting data. c.Displaying data from multiple tables. d.Aggregating data using group function. e.Manipulatingdata. f. Creating and managing tables.
4. Normalization.
5. Creatingcursor.
6. Creating procedure andfunctions.
7. Creating packages andtriggers.
8. Design and implementation of payroll processing system.
9. Design and implementation of Library Information System.
10. Design and implementation of Student Information System.
11. Automatic Backup of Files and Recovery ofFiles.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

DATA STRUCTURES & ANALYSIS OF ALGORITHMS LAB(MCA - 253)

Course Outcome

CO1 Write and execute programs to implement various searching and sorting algorithms.
CO2 Write and execute programs to implement various operations on two-dimensional arrays.
CO3 Implement various operations of Stacks and Queues using both arrays and linked lists data structures.
CO4 Implement graph algorithm to solve the problem of minimum spanning tree

Syllabus

MCA – 253:DATA STRUCTURES & ANALYSIS OF ALGORITHMS LAB

L-T-P :0-0-4 External Max. Marks : 50

Program in C or C++ for following:

1. To implement addition and multiplication of two 2Darrays.
2. To transpose a 2Darray.
3. To implement stack usingarray
4. To implement queue usingarray.
5. To implement circular queue usingarray.
6. To implement stack using linkedlist.
7. To implement queue using linkedlist.
8. To implement BFS using linkedlist.
9. To implement DFS using linkedlist.
10. To implement LinearSearch.
11. 11.To implement BinarySearch.
12. To implement BubbleSorting.
13. To implement SelectionSorting.
14. To implement InsertionSorting.
15. To implement MergeSorting.
16. To implement HeapSorting.
17. To implement Matrix Multiplication by strassen'salgorithm
18. Find Minimum Spanning Tree using Kruskal'sAlgorithm

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

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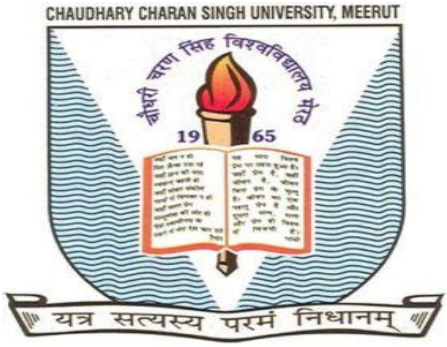

EVALUATION SCHEME &SYLLABUS
First Year
FOR

Evaluation Scheme and

SyllabusFor

Second Year M.C.A.

(Master of Computer Application)

(EffectivefromtheSession:2017-18)

Master of Computer

ApplicationThird Semester

S. No.	Subject Code	SubjectName	Periods			EvaluationScheme					Credit
			L	T	P	Sessional			ESE	Total	
						CT	TA	Total			
1.	MCA-311	OperatingSystems	3	1	0	20	10	30	70	100	04
2.	MCA-312	WebTechnology	3	1	0	20	10	30	70	100	04
3.	MCA-313	Design&Analysisof Algorithms	3	1	0	20	10	30	70	100	04
4.	MCA-314	ComputerBasedOptimizationTechniques	3	1	0	20	10	30	70	100	04
5.	MCA-315	Cyber Security	3	0	0	20	10	30	70	100	03
6.*	MCA -316	Introduction to Programming and ComputerOrganization*	3	0	0	20	10	30	70	100	--
Practical											
7.	MCA-351	OperatingSystemsLab	0	0	3	30	20	50	50	100	02
8.	MCA-352	Design&Analysisof AlgorithmsLab	0	0	6	30	20	50	50	100	03
Total										700	24

FourthSemester

S. No.	Subject Code	SubjectName	Periods			EvaluationScheme					Credit
			L	T	P	Sessional			ESE	Total	
						CT	TA	Total			
1.	MCA-411	DatabaseManagementSystems	3	1	0	20	10	30	70	100	04
2.	MCA-412	ComputerNetworks	3	1	0	20	10	30	70	100	04
3.	MCA-413	ArtificialIntelligence	3	1	0	20	10	30	70	100	04
4.	MCA-414	CompilerDesign	3	1	0	20	10	30	70	100	04
5.	MCA-415	MobileComputing Elective–I	3	1	0	20	10	30	70	100	03
6.*	MCA416	Fundamental of Data Structure, NumericalandComputationalTheory*	3	0	0	20	10	30	70	100	--
Practical											
7.	MCA-451	MiniProject	0	0	6	30	20	50	50	100	03
8.	MCA-452	DatabaseManagementSystemsLab	0	0	3	30	20	50	50	100	02
		Total	15	5	6					700	24

***Note:**MCALateralEntrycandidatesarerequiredtoqualifyfollowingtwoauditcoursesalso.Thesecourseswillbeof qualifying natureandshallnot be considered towardssemester totalof marks.*

* AuditCoursesto becompletedbyMCALateralEntryStudentsonly.

1. *Audit Course1:RCA-A01*
2. *Audit Course2: RCA-A02*

ListofElectives

Elective–I

1. RCA-E11:Design&Development ofApplications
2. RCA-E12:Client-ServerComputing
3. RCA-E13:DataWarehousing &DataMining
4. RCA-E14:AdvancedComputerArchitecture
5. RCA-E15:MobileComputing

MCA : Year-II **Sem: III**

Subject 1 : Operating Systems (MCA-311)

Course Outcomes

1. Explain main components, services, types and structure of Operating Systems.
2. Apply the various algorithms and techniques to handle the various concurrency control issues.
3. Compare and apply various CPU scheduling algorithms for process execution.
4. Identify occurrence of deadlock and describe ways to handle it.
5. Explain and apply various memory, I/O and disk management techniques.

Syllabus

UNIT I–INTRODUCTION: - Computer System Overview-Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization. Operating system overview-objectives and functions, Evolution of Operating System.

UNIT II–PROCESSES: - Process States, Process Description and Process Control. Processes and Threads, Types of Threads, Multicore and Multithreading, Windows 7- Thread and SMP Management.

UNIT III-CONCURRENCY AND SCHEDULING:-Principles of Concurrency-Mutual Exclusion, Semaphores, Monitors, Readers/Writers problem. Deadlocks-prevention-avoidance-detection, Scheduling- Types of Scheduling-Scheduling algorithms.

UNIT IV–MEMORY:- Memory management requirements, Partitioning, Paging and Segmentation, Virtual memory - Hardware and control structures, operating system software, Linux memory management, Windows memory management.

UNIT V - INPUT/OUTPUT AND FILE SYSTEMS: - I/O management and disk scheduling – I/O devices, organization of I/O functions; OS design issues, I/O buffering, disk scheduling, Disk cache. File management – Organization, Directories, File sharing, and Record blocking, secondary storage management.

References:-

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Andrew S. Tanenbaum, "Modern Operating System", PHI Learning
3. Tanenbaum /Woodhaull "Operating System Design and Implementation", Pearson Publication.
4. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
5. Flynn, "Understanding Operating System" , Cengage.
6. D M Dhamdhere, "Operating Systems : A Concept basedApproach", McGraw Hill.
7. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education".
8. Stuart E. Madnick& John J. *Donovan.Operating Systems.*McGraw Hill.
9. A. K. Sharma, "Operating System", University Press.
10. Achyut S Godbole, Atul kahate , "Operating System", McGraw Hill

Subject 2: **Web Technology (MCA-312)**

Course Outcomes

1. On completion of this course, a student will be familiar with client server architecture and able to develop a web application using web technologies.
2. Students will gain the skills and project based experience nee Course Outcomes : ded for entry into web application and development careers.
3. Students are able to develop a dynamic webpage by the use of java script and DHTML. Students will be able to write a well formed / valid XML document. Students will be able to write a

server side java application called Servlet to catch form data sent from client, process it and store it on database.

4. Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.
5. The course is intended for those who have never done anything with HTML or web pages (static and dynamic), and would like to build this basic knowledge for starting a career as a web developer or for learning how to program HTML for web pages HTML/ HTML5, CSS, JavaScript, VB Script.
6. Web development strategies using server side programming with ASP, JSP, Com/D-Com, PHP and at the end of the course you'll gain knowledge about where to go next to further your front-end web development skills.

Syllabus

UNIT I- INTRODUCTION & WEB DESIGN:- Introduction: Concept of WWW, Internet and WWW, HTTP Protocol: Request and Response, Web browser and Web servers, Features of Web 2.0

Web Design: Concepts of effective web design, Web design issues including Browser, Bandwidth and Cache, Display resolution, Look and Feel of the Website, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation.

UNIT II- HTML & STYLE SHEETS:- HTML: Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, XHTML, Meta tags, Character entities, frames and frame sets, Browser architecture and Web site structure. Overview and features of HTML 5

Style sheets : Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of CSS3

UNIT III- JAVESCRIPT & XML:- JavaScript : Client side scripting with JavaScript, variables, functions, conditions, loops and repetition, Pop up boxes, Advance JavaScript: JavaScript and objects, JavaScript own objects, the DOM and web browser environments, Manipulation using DOM, forms and validations, DHTML : Combining HTML, CSS and JavaScript, Events and buttons

XML: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Using XML with application. Transforming XML using XSL and XSLT

UNIT IV- PHP:- PHP : Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP

UNIT V- MYSQL:- PHP and MySQL : Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP myadmin and database bugs

References:-

1. Developing Web Applications, Ralph Moseley and M. T. Savaliya, Wiley-India
2. Web Technologies, Black Book, Dreamtech Press
3. HTML 5, Black Book, Dreamtech Press
4. Web Design, Joel Sklar, Cengage Learning
5. Developing Web Applications in PHP and AJAX, Harwani, McGraw Hill
6. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel, Pearson

Subject 3: **Design and Analysis of Algorithms (MCA-313)**

Course Outcomes

1. Argue the correctness of algorithms using inductive proofs and invariants.
2. Analyze worst-case running times of algorithms using asymptotic analysis.
3. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
4. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
5. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
6. Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate. Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyze them.
7. Explain the different ways to analyze randomized algorithms (expected running time, probability of error). Recite algorithms that employ randomization. Explain the difference between a randomized algorithm and an algorithm with probabilistic inputs.

Syllabus

UNIT-I INTRODUCTION: Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, Sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time.

UNIT-II ADVANCED DATA STRUCTURES: - Red-Black trees, B-trees, Binomial Heaps, Fibonacci Heaps.

UNIT-III DIVIDE AND CONQUER, GREEDY METHOD: Sorting, Matrix Multiplication, Convex hull and Searching. Greedy methods with examples such as Optimal Reliability Allocation, Knapsack, and Minimum Spanning trees-Prim's and Kruskal's algorithms, Single source shortest paths – Dijkstra's and Bellman Ford algorithms.

UNIT–IV DYNAMIC PROGRAMMING, BACKTRACKING AND BRANCH AND BOUND: - Dynamic programming with examples such as Knapsack, All pair shortest paths – Warshall's and Floyd's algorithms, Resource allocation problem. Backtracking, Branch and Bound with examples such as Travelling Salesman Problem, Graph Colouring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.

Unit -V Selected Topics: Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-completeness, Approximation algorithms and Randomized algorithms.

References:-

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. RCT Lee, SS Tseng, RC Chang and YT Tsai, "Introduction to the Design and Analysis of Algorithms", McGraw Hill, 2005.
3. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
4. Berman, Paul," Algorithms", Cengage Learning.
5. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" ,Pearson Education, 2008.
6. Jon Kleinberg, Eva Tardos, "Algorithm Design" ,Pearson Education.

Subject 4 : COMPUTER BASED OPTIMIZATION TECHNIQUES (MCA-314)

Course Outcomes

1. Formulate and solve problems as networks and graphs.
2. Develop linear programming (LP) models for shortest path, maximum flow, minimal spanning tree, critical path, minimum cost flow, and transport problems.
3. Solve the problems using special solution algorithms

Syllabus

UNIT I-PRELIMINARIES:- Inventory Models and Replacement problems: Inventory models – various costs-deterministic inventory models, Single period inventory model with shortest cost, stochastic models, Application of inventory models, Economic lot sizes-price breaks, and Replacement problems-capital equipment-discounting costs-replacement in anticipation of failure-group replacement-stochastic nature underlying the failure phenomenon.

UNIT II-LINEAR PROGRAMMING PROBLEMS (LPP):- Definition of LPP, Graphical Solutions of Linear Programming Problems, Simplex Method, and Artificial Variable Method, Two Phase Method, Charnes' Big-M Method, Sensitivity Analysis, Revised Simplex Method, Duality, Dual Simplex Method

UNIT III-INTEGER LINEAR PROGRAMMING PROBLEMS: - Integer Linear Programming Problems, Mixed Integer Linear Programming Problems, Cutting Plane Method, Branch and Bound Method, 0-1 integer linear programming problem. Transportation Problems: Introduction to Transportation Model, Matrix Form of TP, Applications of TP Models, Basic Feasible Solution of a TP, Degeneracy in TP, Formation of Loops in TP, Solution Techniques of TP, Different Methods for Obtaining Initial Basic Feasible Solutions viz. Matrix Minima Method, Row Minima Method, Column Minima Methods, Vogel's Approximation Method, Techniques for Obtaining Optimal Basic Feasible Solution. Assignment Problems: Definition, Hungarian Method for AP.

UNIT IV-INTRODUCTION TO NLP:- Definition of NLP, Convex Programming Problems, Quadratic Programming Problems, Wolfe's Method for Quadratic Programming, Kuhn-Tucker Conditions, Geometrical Interpretation of KT-Conditions, KT-Points etc. Dynamic Programming: Bellman's Principle of optimality of Dynamic Programming, Multistage decision problem and its solution by Dynamic Programming with finite number of stages, Solution of linear programming problems as a Dynamic Programming problem

UNIT V-QUEUING THEORY:-Introduction to Queues, Basic Elements of Queuing Models, Queue Disciplines, Memoryless Distribution, Role of Exponential and Poisson Distributions, Markovian Process, Erlang Distribution, Symbols and Notations, Distribution Of Arrivals, Distribution of Service Times, Definition of Steady and Transient State, Poisson Queues.

References:-

1. Hadley, G., "Linear Programming, and Massachusetts", Addison-Wesley
2. Taha, H.A, "Operations Research – An Introduction", Macmillian
3. Hiller, F.S., G.J. Lieberman, " Introduction to Operations Research", Holden-Day
4. Harvey M. Wagner, "Principles of Operations R search with e Applications to Managerial Decisions", Prentice Hall of India Pvt. Ltd.
5. Swarup K etal, "Operation Research", S. Chand

Subject 5: **Cyber Security (MCA-315)**

Course Outcomes

1. Follow a structured model in Security Systems Development Life Cycle (SDLC)
2. Detect attack methodology and combat hackers from intrusion or other suspicious attempts at connection

to gain unauthorized access to a computer and its resources

3. Protect data and respond to threats that occur over the Internet
4. Design and implement risk analysis, security policies, and damage assessment
5. Plan, implement and audit operating systems' security in a networked, multi-platform and cross platform environment
6. Provide contingency operations that include administrative planning process for incident response, disaster recovery, and business continuity planning within information security

Syllabus

UNIT I

Introduction to information systems, Types of information Systems, Development of Information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.

UNIT II

Application security (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control.

Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail viruses, Macro viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce- Electronic Payment System, e-Cash, Credit/Debit Cards. Digital Signature, public Key Cryptography.

UNIT III

Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets, Access Control, CCTV and intrusion Detection Systems, Backup Security Measures.

UNIT IV

Security Policies, Why Policies should be developed, WWW policies, Email Security policies, Policy Review Process-Corporate policies-Sample Security Policies, Publishing and Notification Requirement of the Policies.

Information Security Standards-ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law: Copy Right Law, Software License, Semiconductor Law and Patent Law.

References:-

1. Charles P. Pfleeger, Shari Lawerance Pfleeger, "Analysing Computer Security", Pearson Education India.
2. V.K. Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India.
3. Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen kumar Shukla ,"Introduction to Information Security and Cyber Law" Willey Dreamtech Press.
4. Schou, Shoemaker, "Information Assurance for the Enterprise", Tata McGraw Hill.
5. CHANDER, HARISH, "Cyber Laws And It Protection", PHI Learning Private Limited, Delhi, India

(Qualifying Course-1)

Subject 6 : Introduction to Programming and Computer Organization (MCA-316)

Course Outcomes

1. Able to implement the algorithms and draw flowcharts for solving Mathematical and Engineering problems.

2. Demonstrate an understanding of computer programming language concepts.
3. Develop confidence for self education and ability for life-long learning needed for Computer language.
4. Understand the theory and architecture of central processing unit.
5. Analyze some of the design issues in terms of speed, technology, cost, performance.
6. Design a simple CPU with applying the theory concepts.
7. Use appropriate tools to design verify and test the CPU architecture

Syllabus

UNIT-I

Natural Numbers: - Well Ordering Principle, Principle of Mathematical Induction.
Set Theory: - Ordered Sets, Relations, Equivalence Relations and Partitions, Modular Arithmetic.
Functions: - Functions, Composition of Functions, one-one, onto and Inverse of a function

UNIT-II

Data representation: - signed and unsigned number representation, fixed and floating point representations. **Basic Electronics:** - Digital Logic Boolean algebra. Combinational and sequential circuits, GateMinimization.
Computers Fundamentals:- Functional Units-Processor, Memory, Input/ output, Register OrganizedComputer, Buses- Organization, Hierarchical Bus, Types, Control, Timing, Width, Clock.

UNIT-III

CPU Organization: Fundamentals, Instruction Set formats, modes, types, Fixed and Floating pointarithmetic.
Architecture Concepts: - Instruction set architecture of a CPU-register, instruction execution cycle.
Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards.

UNIT-IV

Introduction to programming: - Problem solving and expression of solution through flow chart andalgorithm.
Parts of a program: - primitive data types, variables, operators and their precedence, expressions,input/output, conditionals and branching, looping statements.
Stored Programs: Procedures, Functions, Storage classes-scope and life time, recursion.

References:-

1. Discrete Mathematics and Its Applications: Kenneth H. Rosen
2. Digital Logic and Computer Design: M. Morris Mano
3. Fundamentals of Programming Languages: Dipali P. Bavishankar, Technical Publications

Lab Subjects
Operating Systems Lab (MCA-351)

Course Outcomes

1. Know how data is transmitted and checking of errors.,
2. Simulation of CPU Scheduling Algorithms. (FCFS, RR, SJF, Priority, MultilevelQueuing)
3. Simulation of Banker's Algorithm for Deadlock Avoidance, Prevention
4. Program for FIFO, LRU, and OPTIMAL page replacement algorithm
5. The students, after the completion of the course, are expected to
6. Compare the performance of various CPU Scheduling Algorithms.

Lab Assignments

1. To implement CPU Scheduling Algorithms

    - FCFS

- SJF
- SRTF
- PRIORITY
- ROUND ROBIN

2. Simulate all Page Replacement Algorithms

   - FIFO
   - LRU

3. Simulate Paging Technique of Memory Management

Subject: Web Technology Lab:

Course Outcome:

CO 1
Develop static web pages using HTML
CO 2
Develop Java programs for window/web-based applications.
CO 3
Design dynamic web pages using Javascript and XML.
CO 4
Design dynamic web page using server site programming Ex. ASP/JSP/PHP
CO 5
Design server site applications using JDDC,ODBC and section tracking API

Subject: Mini Project:

Course Outcome:

1. Understand, plan and execute a Mini Project with team.
2. Implement electronic hardware by learning PCB artwork design, soldering techniques testing and troubleshooting etc.
3. Prepare a technical report based on the Mini project.
4. Deliver technical seminar based on the Mini Project work carried out.

DatabaseManagementSystems (MCA-411)

Course Outcomes

5. Defines the basics of the relational data model.
6. Lists the database design process steps.
7. Will be able to design and implement properly structured databases that match the standards based under realistic constraints and conditions.
8. Develops an Entity-Relationship model based on user requirements.

UNIT I–INTRODUCTION:-The Evolution of Database Systems- Overview of a Database ManagementSystem-Outline of Database-System Studies-The Entity- RELATIONSHIP DATA MODEL: Elements of theE/RModel-Design Principles-The Modellingof Constraints-WeakEntitySets

UNIT II - THE RELATIONAL DATA MODEL & ALGEBRA: - Basics of the Relational Model-FromE/R Diagrams to Relational Designs Converting Subclass Structures to Relations Functional Dependencies-Rules About Functional Dependencies-Design of Relational Database Schemas - Multivalued

Dependencies.RELATIONAL ALGEBRA: Relational Operations-Extended Operators of Relational Algebra-Constraints onRelations

UNITIII-SQL:-SimpleQueriesinSQL-Subqueries-Full-RelationOperations-DatabaseModifications-Defining a Relation Schema-View Definitions- Constraints and Triggers: Keys and Foreign Keys-Constraintson Attributes and Tuples Modification of Constraints-Schema-Level Constraints and Triggers -Java DatabaseConnectivity-SecurityandUserAuthorization in SQL

UNIT IV -INDEX STRUCTURE,QUERYPROCESSING:-IndexStructures:Indexeson SequentialFiles-Secondary Indexes-B-Trees-Hash Tables-Bitmap Indexes. QUERY EXECUTION: Physical-Query-PlanOperators-One-Pass,two-pass&indexbasedAlgorithms,BufferManagement,ParallelAlgorithms-EstimatingtheCost of Operations-Cost-Based PlanSelection-Order forJoins-Physical-QueryPlan

UNIT V - FAILURE RECOVERY AND CONCURRENCY CONTROL:-Issues and Models for ResilientOperation-Undo/Redo Logging-ProtectingagainstMedia Failures

CONCURRENCYCONTROL:SerialandSerializableSchedules-ConflictSerializability-EnforcingSerializability by Locks-Locking Systems with Several Lock Modes-Concurrency Control by Timestamps,validation.

TRANSACTIONMANAGEMENT: SerializabilityandRecoverability-ViewSerializability-ResolvingDeadlocks-DistributedDatabases:Commitand Lock

References:-

1. HectorGarcia-Molina, JeffUllman,and JenniferWidom,"DatabaseSystems:TheCompleteBook",Pearson Education,Second Edition,2008.
2. Silberschatz,H.KorthandSudarshanS.,"DatabaseSystemConcepts",6thEdition,McGraw-HillInternational,2010.
3. Elmasri R. and Shamakant B.Navathe, "Fundamentals of Database Systems", 6th Edition,AddisionWesley, 2011.

COMPUTERNETWORK(MCA-412)

Course Outcomes

1. Describe communication models TCP/IP, ISO-OSI model, network topologies along with communicating devices and connecting media.
2. Apply knowledge of error detection, correction and learn concepts of flow control along with error control.
3. Classify various IP addressing techniques, subnetting along with network routing protocols and algorithms.
4. Understand various transport layer protocols and their design considerations along with congestion control to maintain Quality of Service.
5. Understand applications-layer protocols and elementary standards of cryptography and network security.

UNITI-DATACOMMUNICATIONS:-

Data communication Components – Data representation and Data flow – Networks – Types of Connections – Topologies – Protocols and Standards – OSI model – Transmission Media – LAN –Wired LANs, WirelessLANs,ConnectingLANs,VirtualLANs.

UNITII–DATALINK LAYER:-

Error Detection and Error Correction – Introduction–Block coding–Hamming Distance – CRC–Flow Controland Error control – Stop and Wait – Go back – N ARQ – Selective Repeat ARQ – Sliding Window – Piggybacking– RandomAccess – CSMA/CD,CDMA/CA.

UNITIII–NETWORKLAYER:-

Switching–Logical addressing – IPV4 – IPV6–Address mapping–ARP, RARP, BOOTP and DHCP–Delivery,Forwardingand UnicastRoutingprotocols.

UNITIV–TRANSPORTLAYER:-

Process to Process Delivery – User Datagram Protocol – Transmission Control Protocol – SCTP – CongestionControl with Examples.

UNITV–APPLICATIONLAYER:-

DomainNameSpace–DDNS–TELNET–EMAIL–FiletransferWWW–HTTP–SNMP–Cryptography –Basicconcepts.

References:-

1. BehrouzA.Forouzan,"DatacommunicationandNetworking",TataMcGraw–Hill,FourthEdition,2011.
2. LarryL.Peterson,PeterS.Davie,"ComputerNetworks",Elsevier,FifthEdition,2012.
3. WilliamStallings,"DataandComputer Communication", EighthEdition,PearsonEducation,2007.
4. JamesF.Kurose,KeithW.Ross,"ComputerNetworking:ATop–DownApproachFeaturingtheInternet",Pearson Education, 2005.

ArtificialIntelligence(MCA-413)

Course Outcomes

1. Define the meaning of intelligence and study various intelligent agents.
2. Understand, analyze and apply AI searching algorithms in different problem domains.
3. Study and analyze various models for knowledge representation.
4. Understand the basic concepts of machine learning to analyze and implement widely used learning methods and algorithms.
5. Understand the concept of pattern
6. Classification and clustering techniques

Unit-I INTRODUCTION:- Introduction to Artificial Intelligence, Foundations and History of ArtificialIntelligence,ApplicationsofArtificialIntelligence,IntelligentAgents,StructureofIntelligentAgents.Computer vision, NaturalLanguage Possessing.

UNIT-II INTRODUCTION TO SEARCH:- Searching for solutions, Uniformed search strategies, Informedsearch strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games,Alpha -Beta pruning.

UNIT-III KNOWLEDGE REPRESENTATION & REASONING:- Propositional logic, Theory of firstorder logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning,Utilitytheory, Hidden MarkovModels (HMM),BayesianNetworks.

UNIT-IVMACHINELEARNING:-Supervisedandunsupervisedlearning,Decisiontrees,Statisticallearning models, Learning with complete data - Naive Bayesmodels, Learning with hidden data - EMalgorithm,Reinforcementlearning,

UNIT-VPATTERNRECOGNITION:-Introduction,Designprinciplesofpatternrecognitionsystem,Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) andLinear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbour (NN) Rule, BayesClassifier,SupportVectorMachine(SVM),K–means clustering.

References:-

1. StuartRussell,PeterNorvig,"ArtificialIntelligence–AModernApproach",PearsonEducation
2. ElaineRichandKevinKnight,"ArtificialIntelligence",McGraw-Hill
3. ECharniakandDMcDermott,"IntroductiontoArtificialIntelligence",PearsonEducation
4. DanW.Patterson,"Artificial IntelligenceandExpert Systems",PrenticeHallofIndia

CompilerDesign(MCA-414)

Course Outcomes

1. Acquire knowledge of different phases and passes of the compiler and also able to use the compiler tools like LEX, YACC, etc.
2. Students will also be able to design different types of compiler tools to meet the requirements of the realistic constraints of compilers.
3. Understand the parser and its types, Top-Down and Bottom-up parsers and construction of LL, SLR, CLR, and LALR parsing table.
4. Implement the compiler using syntax-directed translation method and get knowledge about the synthesized and inherited attributes.

5. Acquire knowledge about run time data structure like symbol table organization and different techniques used in that.
6. Understand the target machine's run time environment, its instruction set for code generation and techniques used for code optimization

UNIT I - COMPILERS: GRAMMARS & AUTOMATA:- Languages – Grammars – Types of grammars – Context free grammar - regular expression - Recognizing of patterns - finite automation (deterministic & nondeterministic) Conversion of NDFA to DFA - Conversion of regular expression of NDFA – Thompson'sconstruction-minimizationofNDFA–Derivation -parse tree– ambiguity

UNITII-LEXICALANALYSIS:-Lexicalanalysis-handles-tokenspecification-designoflexicalanalysis (LEX) - Automatic generation of lexical analyzer - input buffering - A language for specifying lexicalanalyzers-implementationoflexicalanalyzer

UNIT III - SYNTAX ANALYSIS – PARSING:- Definition - role of parsers - top down parsing - bottom-upparsing - Left recursion - left factoring - Handle pruning , Shift reduce parsing - operator precedence parsing –FIRST-FOLLOW-LEADING-TRAILING-Predictiveparsing-recursivedescentparsing.LRparsing–LR (0) items - SLR parsing – Canonical LR - LALR parsing - generation of LALR - Ambiguous grammars - errorrecovery

UNITIV-SYNTAXDIRECTEDTRANSLATION:-IntermediateLanguages-prefix-postfix-Quadruple - triple - indirect triples – syntax tree- Evaluation of expression - three-address code- Synthesizedattributes – Inherited attributes – Conversion of Assignment statements- Boolean expressions –Backpatching -Declaration-CASEstatements.

UNITV-CODEOPTIMIZATION:-Localoptimization-LoopOptimizationtechniques–DAG–Dominators-Flowgraphs –Storage allocations-Peepholeoptimization – IssuesinCode Generation.

References:-

1. AlfredVAho,JefferyDUllman,RaviSethi,"Compilers,Principlestechniquesandtools",PearsonEducation2011
2. RaghavanV.,"Principlesof Compiler Design",TataMcGrawHill EducationPvt.Ltd.,2010.
3. DavidGalles,"ModernCompilerDesign",PearsonEducation,Reprint2012.
4. DasaradhRamaiah.K.,"IntroductiontoAutomataandCompiler Design",PHI, 2011

RCA-E15MOBILECOMPUTING(MCA-415)

Course Outcomes

1. Study and aware fundamentals of mobile computing.
2. Study and analyze wireless networking protocols, applications and environment.
3. Understand various data management issues in mobile computing.
4. Analyze different type of security issues in mobile computing environment.\
5. Study, analyze, and evaluate various routing protocols used in mobile computing

UNIT– I

Introduction,issuesinmobilecomputing,overviewofwirelesstelephony:cellularconcept,GSM:air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation incellularsystems, CDMA, GPRS.

UNIT-II

Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multipleaccess protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture,protocolstack, applicationenvironment, applications.

UNIT– III

Data management issues, data replication for mobile computers, adaptive clustering for mobile wirelessnetworks,Filesystem, Disconnected operations.

UNIT-IV

MobileAgentscomputing,securityandfaulttolerance,transactionprocessinginmobilecomputingenvironment.

UNIT– V

Ad Hoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destinationsequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distancevectorrouting(AODV),Temporaryorderedroutingalgorithm(TORA),QoSinAdHocNetworks,applicatio ns.

References:-

1. J.Schiller,MobileCommunications,AddisonWesley.
2. A.Mehrotra,GSMSystemEngineering.
3. M.V.D.Heijden,M.Taylor,UnderstandingWAP,ArtechHouse.
4. CharlesPerkins,MobileIP,AddisonWesley.
5. CharlesPerkins,AdhocNetworks,AddisonWesley.

(Qualifying Course-2)

RCA-A02FundamentalofDataStructure,NumericalandComputationalTheory

(MCA-416)

Course Outcomes

1. Apply the knowledge of data structure concepts and the various algorithms while designing and developing software and some hardware.
2. Analyze and prove the equivalence of languages and illustrate how to design finite state machines and convert regular expressions to FSA.

UNIT-I

Arrays:- Array Definition, Representation and Analysis, Single andMultidimensional Arrays, Searching:Sequential search, binary search, comparison and analysis, Sorting: Insertion Sort, Bubble sort, Quick Sort,TwoWayMerge Sort, Heap Sort.

Linked list:- Representation and Implementation of Singly Linked Lists, Two –way Header List, Traversingand Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists algorithm(Beginning,endand middle).

UNIT-II

BinarySearchTrees: BinarySearchTree(BST),InsertionandDeletioninBST,ComplexityofSearchAlgorithm.
CurvefittingandApproximation: Methodofleastsquares,fittingofstraightlines,polynomials,exponentialcurves.
Regressionanalysis: LinearandNon-linearregression,multipleregressions

UNIT-III

Time series Analysis and Hypothesis Testing:forecasting models and methods. Test of significance, Chi-squaretest, t-test,F-Test
Finite State Machines (FSM): Introduction, Deterministic (DFA), Nondeterministic (NFA). Conversions andEquivalence:EquivalencebetweenNFAwithandwithoutεtransitions.NFAtoDFAconversion.MinimizationofFSM.

UNIT-IV

RegularExpression&RegularSet:Definition,Properties,PumpingLemma,andDecisionproblemforregularlanguage.
Grammar: Introduction, Definition, Differenttypes, Derivation Tree,Different NormalForms,AmbiguousGrammar and itsimplications, Chomskyhierarchy.DifferentClassesofLanguages.
PushdownAutomata(PDA):Definition,PDAandCFL(Context-FreeLanguage),AcceptanceofStrings.
TuringMachine: Introduction,TuringMachineModel.

References:-

1. S.Lipschutz,"DataStructures",Mc-GrawHillInternationalEditions.
2. K.L.P.Mishra,N.Chandrasekaran,"TheoryofComputerScience",PHI.
3. RajendraKumar,"Theoryof Automata,LanguagesandComputation",Mc-GrawHill.
4. M.Goyal,"Computer-BasedNumerical&StatisticalTechniques",InfinitySciencePress.

MCA-451 Mini Project Lab

Course Outcomes

1. Learn to define objective and motivation of your mini - project Work in
2. reference of your Project Title.
3. Learn to explain Hardware and Software technologies used in your project work.
4. Learn to present and explain DFDs of Project (DFD-0, DFD-1, DFD-2 …).
5. Learn to present and explain ER Diagram of Project.
6. Learn to explain Front-End or User Interfaces (One by One) with Purpose and working.
7. Learn to explain Back-End or Database Tables used in your project.
8. Learn to explain Usability or Ultimate output of your project work.
9. Learn to explain Drawback or limitations of your project work.
10. Learn to explain how this work can be carried out in future for improvement.

MCA-452DatabaseManagementSystemsLab

Course Outcomes

Objectives:-

1. Installingoracle.
2. CreatingEntity-RelationshipDiagramusingcasetools.
3. WritingSQLstatements UsingORACLE/MYSQL:
    a) WritingbasicSQLSELECTstatements.

b) Restrictingandsortingdata.
c) Displayingdata frommultipletables.
d) Aggregatingdatausinggroupfunction.
e) Manipulatingdata.
f) Creatingandmanagingtables.

4. NormalizationinORACLE.
5. Creatingcursorinoracle.
6. Creatingprocedure andfunctionsinoracle.
7. Creatingpackagesandtriggersinoracle.

Design&DevelopmentofApplications

UnitI-INTRODUCTION:

IntroductiontoAndroid,ActivitiesandIntents,TestingandDebugging,andBackwardsCompatibility.

Unit2-UserInterface:

UserInteractionandintuitivenavigation,DelightfulUserExperience,Testing yourUI

Unit3-BackgroundTasks:

Connect to the Internet, Notifications and Background Tasks, Triggering, Scheduling and OptimizingBackgroundTasks

Unit4-DataSaving,Retrieving,Loading:

StoringDatainyourapp,StoringDatausingSQLite,SharingData:ContentResolversandContentProviders, LoadingDatausing Loaders

Unit5-PolishandPublish:

PermissionsandLibraries,Securitybestpractices,Widgets,PublishingyourApp,MultipleFormFactors, GoogleServices,Firebase,GoogleCloudMessaging,Makingyourappdatasearchable

References:-

1.TrishCornez&Richard Cornez “AndroidProgrammingConcepts”,Jones&BartlettLearning.

CLIENTSERVERCOMPUTING

UNIT I CLIENT/SERVER COMPUTING:-DBMS concept and architecture, Single system image, ClientServer architecture, mainframe-centric client server computing, downsizing and client server computing,preserving mainframe applications investment through porting, client server development tools, advantages ofclientservercomputing.

UNITIICOMPONENTSOFCLIENT/SERVERAPPLICATION:-The client:services,requestforservices, RPC, windows services, fax, print services, remote boot services, other remote services, UtilityServices & Other Services, Dynamic Data Exchange (DDE), Object Linking and Embedding (OLE), CommonObjectRequestBrokerArchitecture(CORBA).Theserver:Detailedserverfunctionality,thenetworkoperating system, available platforms, the network operating system, available platform, the server operatingsystem.

UNIT III CLIENT/SERVER NETWORK:-connectivity, communication interface technology, Interposescommunication, wide area network technologies, network topologies (Token Ring, Ethernet, FDDI, CDDI)networkmanagement,Client-serversystemdevelopment:Software,Client–ServerSystemHardware:Network Acquisition, PC-level processing unit, Macintosh, notebooks, pen, UNIX workstation, x-terminals,server hardware.

UNIT IV DATA STORAGE:-magneticdisk, magnetic tape, CD-ROM, WORM, Opticaldisk, mirroreddisk,faulttolerance,RAID,RAID-Disknetworkinterfacecards.Networkprotectiondevices,PowerProtectionDevices,UPS,Surgeprotectors.ClientServerSystemsDevelopment:ServicesandSupport,system administration, Availability, Reliability, Serviceability, Software Distribution, Performance, Networkmanagement,HelpDisk,RemoteSystemsManagement Security,LANandNetworkManagement issues.

UNITVCLIENT/SERVERSYSTEMDEVELOPMENT:-Training,TrainingadvantagesofGUIApplication, System Administrator training, Database Administrator training, End-user training. The future ofclientserverComputingEnablingTechnologies,The transformationalsystem.

References:

1. PatrickSmith&SteaveGuengerich,“Client /ServerComputing”,PHI
2. DawnaTravisDewire,“Client/Server Computing”,TMH
3. Majumdar&Bhattacharya,“DatabasemanagementSystem”,TMH
4. Korth,Silberchatz,Sudarshan,“DatabaseConcepts”,McGrawHill
5. Elmasri,Navathe,S.B,“Fundamentalsof DataBaseSystem”,AddisonWesley

RCA-E13DatawarehousingandMining

UNIT I DATA WAREHOUSING:-Overview, Definition, Data Warehousing Components, 8 Building aDataWarehouse,WarehouseDatabase,Mapping theData Warehouse toa MultiprocessorArchitecture,Difference between Database System and Data Warehouse, MultiDimensionalData Model, Data Cubes,Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, DataMarting.

UNITIIDATAWAREHOUSEPROCESSANDTECHNOLOGY:-WarehousingStrategy,Warehouse8 /management and Support Processes, Warehouse Planning and Implementation, Hardware and OperatingSystems for Data Warehousing, Client/Server Computing Model & Data Warehousing. Parallel Processors &Cluster Systems, Distributed DBMS implementations, Warehousing Software, Warehouse Schema Design,DataExtraction, Cleanup &TransformationTools,Warehouse Metadata

UNIT III - DATA MINING:- Overview,Definition & Functionalities, Data 8 Processing, Form of DataPreprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer andHumaninspection),InconsistentData,DataIntegrationandTransformation.DataReduction:- DataCubeAggregation,Dimensionalityreduction, DataCompression, NumerosityRed

UNIT IV - DATA MINING TECHNIQUES:- Classification: Definition, Data Generalization, AnalyticalCharacterization, 8 Analysis of attribute relevance, Mining Class comparisons, Statistical measures in largeDatabases,Statistical-BasedAlgorithms,Distance-BasedAlgorithms,DecisionTree-BasedAlgorithms.Clustering:Introduction,SimilarityandDistanceMeasures,HierarchicalandPartitionalAlgorithms.Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid BasedMethods- STING, CLIQUE. Model Based Method –Statistical Approach, Association rules: Introduction,LargeItemsets,BasicAlgorithms,Parallel andDistributedAlgorithms,Neural Networkapproach.

UNITV-DATAVISUALIZATIONANDOVERALLPERSPECTIVE:-Aggregation,Historical8 information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, DataMininginterface,Security,BackupandRecovery,TuningDataWarehouse,TestingDataWarehouse.Warehousing applications and Recent Trends: Types of Warehousing Applications, Web Mining, SpatialMiningandTemporalMining.

References:-

1. AlexBerson,StephenJ.Smith“DataWarehousing,Data-Mining&OLAP”, TMH
2. MarkHumphries,MichaelW.Hawkins,MichelleC.Dy,“DataWarehousing:ArchitectureandImplementation”, Pearson
3. MargaretH.Dunham,S.Sridhar,”DataMining:IntroductoryandAdvancedTopics”PearsonEducation
4. ArunK.Pujari,“DataMiningTechniques”UniversitiesPress
5. PieterAdriaans,DolfZantinge,“Data-Mining”,PearsonEducation

RCA-E14AdvancedComputerArchitecture

UNIT-I:INTRODUCTION:-
ParallelComputing,ParallelComputerModel,ProgramandNetworkProperties,ParallelArchitecturalClassification Schemes,Flynn's&Feng'sClassification,PerformanceMetrics and Measures, Speedup Performance Laws: Multiprocessor System and Interconnection Networks;IEEEPOSIXThreads:CreatingandExitingThreads,SimultaneousExecutionofThreads,ThreadSynchro nizationusingSemaphore andMutex, Cancellingthe Threads.

UNIT – II: PIPELINING AND MEMORY HIERARCHY:-Basic and Intermediate Concepts, InstructionSet Principle; ILP: Basics, Exploiting ILP, Limits on ILP; Linear and Nonlinear Pipeline Processors; SuperScalar and Super Pipeline Design; Memory Hierarchy Design: Advanced Optimization of Cache Performance,MemoryTechnologyandOptimization,Cache Coherenceand SynchronizationMechanisms.

UNIT–III:THREADANDPROCESSLEVELPARALLELARCHITECTURE:-Introductionto
MIMD Architecture, Multithreaded Architectures, Distributed Memory MIMD Architectures, Shared MemoryMIMDArchitecture,Clustering,InstructionLevelDataParallelArchitecture,SIMDArchitecture,FineGrai ned and Coarse Grained SIMD Architecture, Associative and Neural Architecture, Data Parallel PipelinedandSystolic Architectures,VectorArchitectures.

UNIT – IV: PARALLEL ALGORITHMS:-PRAM Algorithms: Parallel Reduction, Prefix Sums, PreorderTree Traversal, Merging two Sorted lists; Matrix Multiplication: Row Column Oriented Algorithms, BlockOriented Algorithms; Parallel Quicksort, Hyper Quicksort; Solving Linear Systems: Gaussian Elimination,Jacobi Algorithm;ParallelAlgorithmDesign Strategies.

UNIT–V:DEVELOPINGPARALLELCOMPUTINGAPPLICATIONS:-OpenMPImplementationin 'C': Execution Model, Memory Model; Directives: Conditional Compilation, Internal Control Variables,ParallelConstruct,WorkSharingConstructs,CombinedParallelWork-SharingConstructs,MasterandSynchronization Constructs; Run-Time Library Routines: Execution Environment Routines, Lock Routines,TimingRoutines;Simple Examples in'C'. Basics ofMPI.

References:-

1. KaiHwang,"AdvanceComputerArchitecture",TMH
2. Matthew,"BeginningLinuxProgramming",SPD/WROX
3. HennessyandPatterson,"ComputerArchitecture:AQuantitativeApproach",Elsevier
4. DezsoandSima,"AdvancedComputerArchitecture",Pearson
5. Quinn,"ParallelComputing:Theory&Practice",TMH6.Quinn,"ParallelProgramminginCwithMPIand OpenMP",TMH

CH CHARAN SINGH UNIVERISTY
MEERUT

EVALUATION SCHEME &SYLLABUS

Third Year

(Master of Computer Applications)

On

Choice Based Credit System

(Effective from the Session: 2018-19)

Master of Computer Applications 2018-19

FIFTH SEMESTER

Sl. No.	Subject Code	Subject Name	Periods			Evaluation Scheme					Credit
			L	T	P	Sessional			ESE	Total	
						CT	TA	Total			
1.	MCA-511	Computer Graphics & Animation	3	1	0	20	10	30	70	100	04
2.	MCA-512	Software Engineering	3	1	0	20	10	30	70	100	04
3.	MCA- 513	Software Testing Elective – II	3	1	0	20	10	30	70	100	04
4.	MCA- 514	Cloud computing Elective-III	3	1	0	20	10	30	70	100	04
5.	MCA- 515	Big Data Elective – IV	3	1	0	20	10	30	70	100	03
Practical											
7.	MCA-551	Computer Graphics & Animation Lab	0	0	6	30	20	50	50	100	03
8.	MCA-552	Project Based on Software Engineering	0	0	3	30	20	50	50	100	02
		Total	15	5	9					700	24

SIXTH SEMESTER

Sl. No.	Subject Code	Subject Name	Period			Evaluation Scheme					Credit
			L	T	P	Session Exams			ESE	Total	
						CT	TA	Total			
1	MCA-611	Colloquium	0	0	8	-	100	100	-	100	04
2	MCA-612	Industrial Project	0	0	40	-	250	250	350	600	20
		Total	0	0	48					700	24

MCA V Semester Electives

Elective : II

1. RCA-E21 : Cryptography and Network Security
2. RCA-E22 : Natural language Processing
3. RCA-E23 : Human Computer Interaction
4. RCA-E24 : Software Testing
5. RCA-E25 : Modern Application Development

Elective: III

1. RCA-E31 : Cloud Computing
2. RCA-E32 : Soft Computing
3. RCA-E33 : Information Storage Management
4. RCA-E34 : Digital Image Processing
5. RCA-E35 : Distributed Systems

Elective : IV

1. RCA-E41 : Distributed Database Systems
2. RCA-E42 : Simulation and Modeling
3. RCA-E43 : Real Time Systems
4. RCA-E44 : Pattern Recognition
5. RCA-E45 : Big Data

MCA : Year-III **Sem: V**

Subject 1: Computer Graphics & Animation(MCA-511)

Subject Outcome:

1. Understand the basics of computer graphics,various graphics systems and applications of computer graphics.
2. Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
3. Use of geometric transformations on graphics objects and their application in composite form.
4. Extract scene with different clipping methods and its transformation to graphics display device.
5. Explore projections and visible surface detection techniquesfordisplayof3D scene on 2D screen.
6. Render projected objects to naturalize the scene in 2 D view and use of illumination models for this.

Syllabus

UNIT-I: **(8)**

Introduction to Computer Graphics: What is Computer Graphics, Computer Graphics Applications, Computer Graphics Hardware and software, two-dimensional Graphics Primitives: Points and Lines, Line drawing algorithms: DDA, Bresenham's Circle drawing algorithms: Using polar coordinates, Bresenham's circle drawing, mid-point circle drawing algorithm; Filled area algorithms: Scan line: Polygon filling algorithm, boundary filled algorithm.

UNIT-II: **(8)**

Two/Three-Dimensional Viewing: The 2-D viewing pipeline, windows, viewports, window to view port mapping; Clipping: point, clipping line (algorithms): - 4-bit code algorithm, Sutherland-Cohen algorithm, parametric line clipping algorithm (Cyrus Beck). Polygon clipping algorithm: Sutherland-Hodgeman polygon clipping algorithm. Two dimensional transformations: transformations, translation, scaling, rotation, reflection, composite transformation. Three dimensional transformations: Three-dimensional graphics concept, Matrix representation of 3 D Transformations, Composition of 3-D transformation.

UNIT-III: **(8)**

Viewing in 3D: Projections, types of projections, mathematics of planner geometric projections, coordinate systems. Hidden surface removal: Introduction to hidden surface removal. Z- buffer algorithm, scanline algorithm, area sub-division algorithm.

UNIT-IV: **(8)**

Representing Curves and Surfaces: Parametric representation of curves: Bezier curves, B-Spline curves. Parametricrepresentation of surfaces; Interpolation method.

Illumination, shading, image manipulation: Illumination models, shading models for polygons, shadows, transparency.What is an image? Filtering, image processing, geometric transformation of images.

UNIT- V: **(8)**

Animation; Fundamentals of computer animation, Animation Techniques. Animation and Flash Overview, Using Layerand Creating Animation

REFRENCES:

1. Procedural Elements for Computer Graphics – David F. Rogers, 2001, T.M.H Second Edition.
2. Fundamentals of 3Dimensional Computer Graphics by Alan Watt, 1999, Addision Wesley.
3. Computer Graphics: Secrets and Solutions by Corrign John, BPB
4. M.C. Trivedi, NN Jani, Computer Graphics, Jaico Publications
5. Rishabh Anand, Computer Graphics- A practical Approach, Khanna Publishing House
6. Graphics, GUI, Games & Multimedia Projects in C by Pilania&Mahendra, Standard Publ.
7. Computer Graphics Secrets and solutions by Corrign John, 1994, BPV
8. Principles of Multimedia by Ranjan Parekh, McGrawHill Education
9. Computer Graphics Principles and Practices second edition by James D. Foley, Andeies van Dam, StevanK.Feiner and Johb F. Hughes, 2000, Addision Wesley.
10. Computer Graphics by Donald Hearn and M.Pauline Baker, 2nd Edition, 1999, PHI
11. Computer graphics, Multimedia and Animation by Malay. K.Pakhira, PHI, 2nd Edition, 2010

Subject 2: Software Engineering(MCA-512)

Subject Outcome:

1. Explain various software characteristics and analyze different software Development Models.
2. Demonstrate the contents of a SRS and apply basic software quality assurance practices to ensure that design, development meet or exceed applicable standards.
3. Compare and contrast various methods for software design.
4. Formulate testing strategy for software systems, employ techniques such as unit testing, Test driven development and functional testing.
5. Manage software development process independently as well as in teams and make use of various software management tools for development, maintenance and analysis.

Syllabus

UNIT-I: **(8)**

Introduction: Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

UNIT-II: **(8)**

Software Requirement Specifications (SRS): Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.

Software Quality Assurance :(SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

UNIT-III:

Software Design: **(8)**

Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs

UNIT-IV: **(8)**

Software Testing: Testing Objectives, UNIT Testing, Integration Testing, 8 Acceptance Testing, Regression Testing, Testing for functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

UNIT-V: **(8)**

Software Maintenance and Software Project Management: Software as an Evolutionary Entity, Need for maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software

Re- Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource allocation Models, Software Risk Analysis and Management.

REFRENCES:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
4. Pankaj Jalote, Software Engineering, Wiley
5. Deepak Jain," Software Engineering: Principles and Practices",Oxford University Press.
6. Munesh C. Trivedi, Software Engineering, Khanna Publishing House
7. N.S. Gill, Software Engineering, Khanna Publishing House

Subject 3 : Software Testing(MCA-E24)

Subject Outcome:

1. Apply various software testing methods.
2. Prepare test cases for different types and levels of testing.
3. Prepare test plan for an application.

4. Identify bugs to create defect report of given application.
5. Test software for performance measures using automated testing tools.

Syllabus

UNIT-I **(8)**

Review of Software Engineering: Overview of software evolution, SDLC, Testing Process, Terminologies in Testing: Error, Fault, Failure, Verification, Validation, Difference between Verification and Validation, Test Cases, Testing Suite, Test Oracles, Impracticality of Testing All data; Impracticality of testing All Paths. Verification: Verification methods, SRS verification, Source code reviews, User documentation verification, and Software project audit, Tailoring Software Quality Assurance Program by Reviews, Walkthrough, Inspection, and Configuration Audits.

UNIT–II **(8)**

Functional Testing: Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique. Structural Testing: Control flow testing, Path testing, Independent paths, Generation of graph from program, Identification of independent paths, Cyclomatic Complexity, Data Flow Testing, Mutation Testing.

UNIT-III **(8)**

Regression Testing: What is Regression Testing? Regression Test cases selection, reducing the number of test cases, Code coverage prioritization technique. Reducing the number of test cases: Prioritization guidelines, Priority category, Scheme, Risk Analysis.

UNIT-IV **(8)**

Software Testing Activities: Levels of Testing, Debugging, Testing techniques and their Applicability, Exploratory Testing Automated Test Data Generation: Test Data, Approaches to test data generation, test data generation using genetic algorithm, Test Data Generation Tools, Software Testing Tools, and Software test Plan.

UNIT-V **98)**

Object oriented Testing: Definition, Issues, Class Testing, Object Oriented Integration and System Testing. Testing Web Applications: What is Web testing?, User interface Testing, Usability Testing, Security Testing, Performance Testing, Database testing, Post Deployment Testing.

REFRENCES:

1. Yogesh Singh, "Software Testing", Cambridge University Press, New York, 2012
2. K..K. Aggarwal &Yogesh Singh, "Software Engineering", New Age International Publishers, New Delhi, 2003.
3. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.
4. Marc Roper, "Software Testing", McGraw-Hill Book Co., London, 1994.
5. Boris Beizer, "Software System Testing and Quality Assurance", Van Nostrand Reinhold, New York, 1984.

Subject 4 : Cloud Computing(MCAE-31)

Subject Outcome:

1. Understand the concepts of Cloud Computing, key technologies, Strengths and limitations of cloud computing.
2. Develop the ability to understand and use the architecture to compute and storage cloud, service and models.
3. Understand the application in cloud computing.

4. Learn the key and enabling technologies that help in the development of cloud.
5. Explain the core issues of cloud computing such as resource management and security.

Syllabus

UNIT-I **(8)**

Introduction: Cloud-definition, benefits, usage scenarios, History of Cloud Computing - Cloud Architecture - Types of Clouds - Business models around Clouds – Major Players in Cloud Computing- issues in Clouds - Eucalyptus - Nimbus -Open Nebula, Cloud Sim.

UNIT-II **(8)**

Cloud Services: Types of Cloud services: Software as a Service-Platform as a Service –Infrastructure as a Service - Database as a Service - Monitoring as a Service –Communication as services. Service providers-Google, Amazon, Microsoft Azure, IBM, Sales force.

UNIT-III **(8)**

Collaborating Using Cloud Services: Email Communication over the Cloud - CRM Management -Project Management-Event Management - Task Management – Calendar - Schedules - Word Processing –Presentation – Spreadsheet - Databases – Desktop - Social Networks and Groupware.

UNIT-IV **(8)**

Virtualization for Cloud: Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization –System Vim, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary translation, HLL VM
- supervisors – Xen, KVM, VMware, Virtual Box, Hyper-V.

UNIT-V **(8)**

Security, Standards and Applications: Security in Clouds: Cloud security challenges – Software as a Service Security, Common Standards: The Open Cloud Consortium – The Distributed management Task Force – Standards for application Developers – Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud.

REFRENCES:

1. David E.Y. Sarna Implementing and Developing Cloud Application, CRC press 2011.
2. Lee Badger, Tim Grance, Robert Patt-Corner, Jeff Voas, NIST, Draft cloud computing synopsis and recommendation, May 2011.
3. Anthony T Velte, Toby J Velte, Robert Elsenpeter, Cloud Computing : A Practical Approach, Tata McGraw-Hill 2010.
4. Haley Beard, Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.
5. G.J.Popek, R.P. Goldberg, Formal requirements for virtualizable third generation Architectures, Communications of the ACM, No.7 Vol.17, July 1974
6. John Rittinghouse & James Ransome, Cloud Computing, Implementation, Management and Strategy, CRC Press, 2010.
7. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Que Publishing, August 2008.
8. James E Smith, Ravi Nair, Virtual Machines, Morgan Kaufmann Publishers, 2006.

Subject 5 : Big Data(MCA-E45)

Subject Outcome:

1. To Understand the Big Data challenges & opportunities and its applications area.
2. Understand data to big data generation, types and development.

3. Gain conceptual understanding of NOSQL Database.
4. Understanding of concepts of map and reduce and functional programming.
5. Gain conceptual understanding of Hadoop Distributed File System.

Syllabus

UNIT-I **(8)**

Understanding big data: What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data ,credit risk management, big data and algorithmic trading, big data and HealthCare, big data in medicine, advertising and big data, big data technologies, Introduction to Hadoop, open source technologies, cloud and big data mobile business intelligence, Crowd sourcing Analytics ,inter and trans firewall analytics

UNIT-II **(8)**

NoSQL data management: Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schema less databases ,materialized views, distribution models ,sharing , masters slave replication , peer-peer replication , sharing and replication , consistency , relaxing consistency , version stamps , map reduce , partitioning and combining , composing map-reduce calculations

UNIT-III **(8)**

Basics of Hadoop; Data format, analyzing data with Hadoop, scaling out , Hadoop streaming , Hadoop pipes , design of Hadoop distributed file system (HDFS) , HDFS concepts , Java interface , data flow ,Hadoop I/O , data integrity , oppression ,serialization , Avro file-based data structures

UNIT-IV **(8)**

Map reduce applications; Map Reduce workflows, UNIT tests with MR UNIT, test data and local tests – anatomy of Map Reduce job run , classic Map-reduce , YARN , failures in classic Map-reduce and YARN , job scheduling , shuffle and sort , task execution , MapReduce types , input formats , output formats

UNIT-V **(8)**

Hadoop related tools; HBase, data model and implementations, Hbase clients, Hbase examples – praxis. Cassandra, cassandra data model, cassandra examples ,cassandra clients , Hadoop integration.Pig , Grunt , pig data model , Pig Latin , developing and testing PigLatin scripts. Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation – HiveQL queries

REFRENCES:

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of
3. Polyglot Persistence", Addison-Wesley Professional, 2012.
4. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
7. V.K. Jain, Big Data & Hadoop, Khanna Publishing House
5. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
6. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
7. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
8. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
9. Alan Gates, "Programming Pig", O'Reilley, 2011.

Lab Subjects

Subject 1: Computer Graphics and Animation Lab(MCA-551)
Course Outcome:
1.Understand the basics of Computer Graphics & different graphics systems and applications of computer graphics.
b) Discuss various algorithms for scan conversion and
filling of basic objects and their comparative analysis.
c) Use of geometric transformations on graphics objects
and their application in composite form.
d) Extract scene with different clipping methods and its
transformation to graphics display device.
e) Explore projections and visible surface detection
techniques for display of 3D scene on 2D screen.
f) Render projected objects to naturalize the scene in 2D
view and use of illumination models for this

LIST OF EXPERIMETNS:

(1) Digital differential Analyzer
(2) Line Drawing Algorithms
(3) Mid-point Circle Generation Algorithm
(4) Creating two-Dimensional Objects
(5) Two-dimensional Transformation
(6) Picture Coloring
(7) Three-Dimensional transformation
(8) Simple Animation using Transformation
(9) Key-Frame Animation
(10) Design Animation using FLASH

Note: Lab can be conducted in "C" language / Virtual Labs /Open GL.

Subject 2: Project Based on Software Engineering(MCA-552)
Course Outcome :
CO1
Identify ambiguities, inconsistencies and incompleteness from a requirements specification and state functional and non-functional requirement
CO 2
Identify different actors and use cases from a given problem statement and draw use case diagram to associate use cases with different types of relationship
CO 3
Draw a class diagram after identifying classes and association among them
CO 4
Graphically represent various UML diagrams , and associations among them and identify the logical sequence of activities undergoing in a system, and represent them pictorially
CO 5
Able to use modern engineering tools for specification, design, implementation and testing

Students are expected to analyse the problem Statement/ case study and design a solution applying software engineering principles

MCA : Year-III **Sem: VI**

Colloquium (MCA-611)

Course Outcomes

1. Carry out a substantial research-based project
2. Demonstrate capacity to improve student achievement, engagement and retention
3. Demonstrate capacity to lead and manage change through collaboration with others
4. Demonstrate an understanding of the ethical issues associated with practitioner research
5. Analyze data and synthesize research findings
6. Report research findings in written and verbal forms
7. Use research findings to advance education theory and practice.
8. Learn how to create unique, plagiarism free content and how to Publish work.

Industrial Project (MCA-612)

Course Outcomes

1. Learn to work in real practical software and industrial development environment where outer world find and access software services for their particular domain in various technologies.
2. Brush-up their knowledge complete in interested areas and software and web technologies.
3. Demonstrate a sound technical knowledge of their selected project topic.
4. Undertake problem identification, formulation and solution.
5. Design engineering solutions to complex problems utilizing a systems approach.
6. Conduct an engineering project.
7. Communicate with engineers and the community at large in written an oral forms.
8. Demonstrate the knowledge, skills and attitudes of a professional engineer.
9. Learn to work in a team to accomplish the desired task in time bound and quality frame form.
10. Learn how to create report of project and presentation with professional required skill set.
11. Student learn Presentation Skills, Discussion Skills, Listening Skills, Argumentative Skills, Critical Thinking, Questioning, Interdisciplinary Inquiry, Engaging with Big Questions, Studying Major Works